THE IRON AGE

Established 1855 New York, November 7, 1912 *Vol. 90: No. 19*

Making a Success of the Machine Shop*

How Avoidable Losses May Be Prevented—When to Buy a New Machine—Where Profits Are Injudiciously Sunk

BY STUART DEAN

People say of a successful man, "He is always lucky" or "He hit it just right." Luck is not the cause of success. Success is due to management and nothing else. One of the largest wagon makers in this country started business at a time when other wagon firms were failing.

A wheel works, on the point of failing, was taken over by the bookkeeper and a foreman. The two men in time paid off all the debts, and each made a large fortune and retired while still comparatively young men. This was management—not luck. Authorities on the subject say Rockefeller would have been successful no matter what business he might have adopted, because he had great managing ability.

To achieve success, seven factors must be kept in mind. Attention must be given to all of them. These factors are:

The Seven Points of Success

1—*Publicity.* Keep your firm's name, its location and its product in every possible buyer's mind.

2.—*Selling Price.* Lower the selling price as business gets dull. Raise it as you get busy. Fix the selling price at a point high enough to turn only one-quarter of your inquiries into orders.

3—*Buying.* Save all you can in buying, both in price and in quantity. Keep as small a stock of material on hand as possible.

4—*Employees and Assistants.* Surround yourself only with capable men.

5—*Design.* Design the parts of your product so that the machine work and assembling will take the least possible time. Continue to change the design as long as improvement can be made.

6—*Low Manufacturing Cost.* Never allow the time for making a piece to be greater than the shortest record time for this piece. If it takes longer, make the foremen explain why, and if there is a fault in the machine tool, jig, or material, correct the fault. This will bring profits.

7—*Thorough Inspection.* Know absolutely that every machine shipped is perfect. This will give you a reputation for fine machinery, which is the best and cheapest advertisement you can have. Inspection of parts will save expense in assembling, and that will reduce your manufacturing costs.

Making a Fortune

The object of every enterprise is to make money—to make a fortune, if possible—for the owners. Luck plays a small part in its ultimate success or failure. Good management and the observance of all the seven points of success determine the final result.

Years ago our forefathers moved from rugged New England, with its fields full of boulders, into States farther west, where the virgin soil raised immense crops and made many people rich. The generation following looked back and said, "What opportunities there were then!" Each succeeding generation still looks back on the preceding one, and says, "What opportunities the former had."

To-day we look back at the prices secured for our product 30 years ago, and say "What an opportunity there was for making money then." At that time the price of manufactured machinery was 50 to 100 per cent. higher than it is now, for the same machinery. As a matter of fact, the opportunity for making money at the present day is greater than it ever was. A firm manufacturing a competitive article can make a comfortable fortune in from 10 to 20 years, if it can sell to the full capacity of the plant and get the full output of the machines, tools and assemblers.

Running Machines to Capacity

The average machine shop operates at about 30 per cent. of its capacity. If you doubt this in your own case,

Shop and Foundry Management

The accompanying article introduces a series of nine or ten contributions on machine shop operations. It continues four articles dealing more particularly with the foundry and appearing in the issues of September 19 and 26 and October 10 and 17. The two series combined cover what may be termed

Shop Methods That Paid Dividends

and represent twelve years' observations of the author as superintendent of the Dean Brothers Steam Pump Works, Indianapolis, in his aim: 1—to reduce cost of production; 2—to increase plant capacity through greater efficiency; 3—to secure quick deliveries; 4—to make a perfect product.

The articles yet to appear are to discuss in part: Design and specifications for metal working machines; the superintendent and his duties; men and their treatment; wage-payment systems; factory systems; machine shop methods; cost keeping; purchasing power, advertising.

just step out into your shop. How many machines are running one speed slower than they should? The tool should be cutting at the rate of 60 to 100 ft. per minute for outside turning of steel and cast iron; at 40 to 60 ft. per minute when boring on inside work; and at 70 to 100 ft. per minute when milling.

Drills of high speed steel should be spinning at a fast rate. A ⅝-in. drill should be revolving so fast that you cannot see the flutes. The modern type of twist drill will drill through 30 in. of cast iron in a minute, or through 4 in. of steel per minute. Are you drilling that fast? The answer will be "No" every time. You should be. To show how the new tool steel has changed conditions, the highest speed on a radial drilling machine, bought 8 years ago, is too slow for a ⅝-in. drill.

Are you trying to turn work on long, slim arbors? It is impossible to take a heavy cut on an arbor unless it is short and thick. Either the work will slip or the arbor will spring.

Look at your steel and cast-iron borings. Are all the steel borings blue in color from the heat generated by the high speed at which the machine was running? Are your cast-iron chips the size of grains of wheat and corn, showing that heavy cuts have been taken? Or are they a pile of iron dust, showing that fine feeds have been used? The feed on all machines should be so heavy that the cutter chatters on the roughing cut. Let the finishing cut take out the chatter marks.

Where to Look for Avoidable Losses

Are the jigs and fixtures such that it takes less than 2 minutes' shut down of machine between the end of the finishing cut on one piece and the start of the first cut on the next piece?

Do you use drill spotting marks in the castings to locate the point of the drill, thus avoiding the use and expense of jigs, and saving the expense of laying out the holes?

Examine the design of your product piece by piece. You will find by redesigning it that 20 to 30 per cent. of the labor cost can be eliminated.

What amount of finish is allowed by the pattern maker? Is it so heavy that the machinist is forced to take three cuts to bring the work to size? He should take but two cuts.

Watch your vise hands. What tools do they use the most, the wrench or the hammer, chisel or file? Parts should come to them from the machines so that erecting is merely a bolting-together process. No chipping, filing, hand tapping, hand studding, hand scraping, drawing over of holes, patching or shimming should be allowed. Whenever a man uses a hammer and chisel, or a file, it means that a blunder has been made somewhere. A mistake has been made in the machine shop, pattern shop or in the drafting room.

Look down the main aisle of the plant. Isn't there a gang of men tramping up and down, some of whom should be working? At the tool room is not the group of men standing there greater than necessary? Are there not places where two men are working at half speed where one man could do the work of the two?

Watch the foremen. Are they not doing too much clerical work and not enough overseeing? They are hired for overseeing.

If your plant is driven by electricity, take meter readings at your generator every 15 minutes for one day. Note the slow start in the use of power in the morning, also the let down in the late afternoon.

Have all the designing rules that look to economy been followed? Are you eliminating all brass work possible from your designs? Is your design such that you are doing a lot of unnecessary machine work which by closer foundry work could be entirely eliminated? Look at a cast-iron lock. Nearly all the parts in it are just as they came from the foundry. They have practically no machine work on them, yet they work perfectly and last indefinitely. See how ingeniously hardware and agricultural machinery are designed in this respect.

Saving in the Foundry

Look at the pile of scrap rejected by the machine shop on account of bad foundry work. This can be reduced. On the most difficult kinds of casting this loss can be kept down as low as 5 per cent., which means that only 5 per cent. of the castings of a difficult nature machined by the machine shop will prove defective on account of bad foundry work.

Is the jar ram molding machine used on all large molds? Is the making of a mold divided into parts, skilled men working on the skilled part of molding only? Are all other parts of mold making done by handy men? Is the squeezer type of machine that makes both cope and drag at one squeeze used on small work? On medium-sized and large work the jarring machine will reduce the molding time 60 to 75 per cent. The squeezer will cut the small molding cost 40 to 50 per cent.

Time your best squeezer molding machine man and your best bench molder on making one mold. Figure at this rate how many molds he should have made. If he is making no unnecessary motions allow him, say, 20 per cent. leeway for resting and other incidentals that interfere with the steady run of the work. Is he putting up a good day's work?

Are you running 66 to 75 per cent. scrap, or its equivalent, in off-grade pig iron in the cupola? This is absolutely practicable no matter how fine a grade of castings is being made. Does your iron come glistening white hot from your cupola, thus eliminating dirt and bubbles in your machined faces?

Are you using a mixture with as high a percentage of lead and zinc in it as is permissible on your work? Zinc and lead are very low-priced metals as compared to copper and tin, and the use of them will reduce your brass cost.

Eliminating False Movements

Are the men making false movements Is their work arranged so that they have eliminated all the unnecessary steps? Instead of giving each man a book of rules and regulations, it might be better to give him a little book teaching him the correct cutting speeds and feeds for different metals, the use of the micrometer index dials on the machine feed screws for duplicating work, and how to eliminate false movements.

Are the total tons output of the plant each year higher than the previous year, without any increase in the hours of labor? There should be an improvement in this respect each year.

Take advantage of all these points, because the profits lie in these small savings throughout the plant. A plant that does not save on all the smallest details will run at a loss, or, at best, just break even. A competitor who just breaks even sets the selling price on your article. He cannot sell any cheaper and continue to exist. Your profit then, if you sell at his price, is what you can save in the little leaks here and there that he neglects.

A 24-lb Pump of 18 Pieces for $1

A small hand pump is a good illustration of what can be done in economical manufacturing. It is about down to the rock-bottom limit for manufacturing cost. A No. 2 iron cistern pump, with a 1¼-in. suction pipe, weighs 24 lb., and is sold by the manufacturer to the dealer for $1. This is at the rate of 4 cents per pound.

The pump is made up of 18 pieces, counting the bolts but not the nuts. The pieces are: Handle; spout; 3-in. cylinder; base; forged sucker rod; piston; piston follower; cup leather; leather suction valve; leather suction valve weight; leather suction valve screw; leather suction valve washer; suction pipe reducer; two bolts in handle; one bolt for holding on the spout; two bolts for holding the cylinder to the base. Every piece has machine work on it. The sucker rod has forge work on it. The cylinder is bored and polished its full length.

Just analyze what the $1 that the manufacturer gets for this pump has to cover. We will assume that the profit is 9 cents on the pump, or about 10 per cent. of the cost. Then 91 cents must cover all expenses. Assuming the material and casting cost at 2 cents per pound, which is extremely low, gives a total of 48 cents for the 24 lb. of material. This only leaves 43 cents, about 1¾ cents per pound, to machine, to assemble and to pay office expenses, advertising, overhead expenses and bad debts.

The assumption of 2 cents per pound for the castings, bolts and other material is low for this work. The cheap, heavy handle would be offset by the cored cylinder and lighter pieces. It can be done, though, as foundries sell furnace work at 2¼ cents per pound, stove plate at 2.4 cents per pound and the lighter work at 2¾ cents per pound when pig iron is $17.50 per ton. The foundry's costs are lower than these.

Manufacture for a Bottomless Selling Price

How would you like to sell your product for 4 cents per pound? Go at your manufacturing proposition as though this were the case, and you will make your fortune so fast you will not know where to invest your money. Don't assume that the selling price of a product has reached its bottom; it has not. Firms are making money manufacturing bicycles to-day and selling them to the dealer at $10 apiece. They used to be sold at $50 apiece.

This shows what can be done in price cutting if enough pressure is brought to bear on a product. The output per man in the machine and erecting shop of a certain company increased 84 per cent. and in the foundry 34 per cent. per man in three years. This concern did not take full advantage of its improved position. It was satisfied; satisfied people never do their best. It did not push the sales as it should. It sold more each year, but the sales did not increase as fast as the plant capacity increased from improved methods. The nearest the sales got to the manufacturing capacity in one year was 75 per cent. The number of employees dropped from 230, working overtime, to 165 with no overtime. To-day machines and vises are standing empty, although the business is larger than it ever was before. The interesting thing about this company is that the increase was made purely by management and not by getting in new machinery. In fact, nine-tenths of the machine tools were so old that the companies that had made them had gone out of business. It took the firm about 25 years to get rich, whereas it could have done it in 10 or 15 if it had sold to capacity each year.

Spending Money for Equipment

The above is a good example of that type of successful management which lies in working old equipment to the limit, thus increasing the output of the plant without added equipment expense. It is management and not equipment that makes the money. Generally speaking, more money can be made from old machines that are paid for than by borrowing money for new machines to replace the old ones. The heaviest old machines will safely cut 10 cu. in. of cast iron per minute from a casting. This is a good rate.

The old machines have their place. On the lighter classes of work they can keep right up with the modern tools so far as output is concerned. All that is needed is here and there a heavy, high-powered, modern machine to do the hogging work of the plant. New equipment should be of a durable nature, and also of a sort that requires little attention. But no matter what be the economy of a machine or an appliance, if it takes more than usual attention to keep it going, or to keep it in repair it is not practical, and all the advantage of the economy is lost.

A plant full of old tools, which are run up to their limit, will require a big repair gang. Gears will wear out, parts will be constantly breaking, and the machines themselves will get out of line. When the expense of maintenance and repairs exceeds the interest on the cost of a new machine, then it is economy to make replacement, but not before.

When a New Machine Is Warranted

Often there is a temptation to persuade oneself that money is being lost on account of a plant being crowded. This may be true, but the interest and depreciation on each square foot of idle floor space probably would amount to more than the extra labor would cost due to being overcrowded. Floor space, including the roof overhead, costs on an average $3.25 per square foot. Depreciation, interest, repairs, light, heat, insurance, etc., at 10 per cent. makes an annual charge of 32.5 cents for each square foot of new floor space, which the new equipment will have to earn before you can come out even. Therefore don't enlarge until you actually have to. Many a firm that has had money in the crowded state has failed after enlarging.

If the interest on the money paid out to make a change in equipment and the depreciation on the tools equal the saving made, nothing has been gained. Suppose a new machine tool is bought to replace an old one. This new tool, costing $5,000, will have to average $2.50 profit per day more than the old machine, and continue to earn this through dull times as well as good, because this $5,000 could have been put at interest at 5 per cent. with no depreciation in the principal. Depreciation on the tool should be charged at 10 per cent.; interest and depreciation together would be 15 per cent. of $5,000, or $2.50 per working day.

Improvements do not always pan out as well as expected, so never buy a machine tool that is to be purely a replacement unless the saving effected by it will pay for the new tool in two years. Follow this rule and you will play safe and still make plenty of improvements.

In making radical and expensive changes, write out a plan in detail and shelve it for a while. New ideas will suggest themselves as time goes on. If possible, go and see the plan or machine where it has been in operation for a year or more.

Buy Equipment in Dull Times

Do all your equipment buying in dull times. They come around often enough. You can get concessions then in price that will make it easier for your equipment to pay for itself. An offer of 5 to 10 per cent. below the regular price will be invariably accepted in hard times.

Choose new machinery carefully. The difference in the durability or in the possible output between two different machines is great. Too much thought cannot be given to this matter of selection. The best is none too good, no matter what the price. New things are changed in some detail after being on the market for a year because weak points develop in the first design. Let the other fellow do the experimenting on the new idea.

The pay roll is the big expense, and can be cut down by means of the best machine. A fine machine need turn out but very little more than a poorer one to pay the difference in the first cost, because the life of a machine tool being long, this difference in price is distributed over many years, making the extra charge for each year small.

Put Only Part of the Profits Into Improvements

A certain portion of the profits should be put back into the business in the shape of improvements, but only a portion. Otherwise, a manufacturer is liable to live his life putting all his earnings back into his works. All he has at the end is a large works. Neither he nor his family have ever enjoyed any of his earnings. Suppose a firm's yearly profit equals 10 per cent. of the value of the plant, and suppose this firm increases its plant 10 per cent. yearly; then all profits are returned to the plant and none go to dividends. A competitor will forge ahead of a firm that has over-built because the interest and depreciation on idle equipment and idle space absorb profits.

Go through the plants of some of our immense corporations and note the idle cranes and other equipment that are eating up money in interest and depreciation. This is why they have trouble paying dividends. Fortunes are made by the medium-sized manufacturers with seemingly poor and old equipment, whereas some of the big corporations have a hard task at the end of their fiscal year trying to avoid showing a deficit.

Are you putting money into equipment that never pays a cent on the investment? A poor manager will want to spend thousands of dollars for machinery, jigs, tools, changes in buildings, etc., before he can get started. This is the dodge of a man who is not going to make good. The writer knows a manager who is a wonderful and ingenious mechanic who leaves ruin behind wherever he goes. When he takes charge of a plant he spends so much money for tools and equipment that the firm never survives the financial strain. He is always getting the plant ready to manufacture. He never arrives at the manufacturing point. There is always something more to do.

Equipment Which Is a Constant Expense

A good illustration of an expensive equipment that makes no saving but is a constant expense is the sand-handling and mixing equipment in some of the newer foundries. We still have to see one that actually decreases the number of foundry laborers. Yet thousands of dollars are tied up in this equipment, and thousands more are spent in power, repair bills and attention just to keep the apparatus running. Each of these equipments takes as much shoveling to get the sand into them and out of them as to cut over the sand by hand. A few husky laborers will cut up a lot of sand in a foundry during the night, with no interest or depreciation charge.

At a foundrymen's meeting the principal speaker of the afternoon read a paper on "Modern Foundry Practice." He was the manager of a completely equipped foundry, and said: "To turn out castings economically you must have electric traveling cranes in the foundry and in the yard, overhead trolleys, power boom-derricks, inter-shop tracks and cars, mold ovens, sand-mixing machinery, sand conveyors to each floor, open gratings in the floor to shake molds out over, lockers for the men's clothing, shower baths, etc. Later, in a discussion on the selling price of castings, this same speaker said: "Something ought to be done to stop the cutting of prices on castings. You do not know what kind of foundries we have up in Chicago. Little low-roofed dark smoky places, down below the street level, where the molders have to work all day by gas light. The way some of those foundries cut prices is a caution. I do not see how they do it and continue to exist. We, with all our fine equipment, lose money when we try to meet their prices." This was an unconscious admission that his company had loaded itself with expensive equipment, charge and repair bills that made it hard to meet competitive prices.

The Value of a Night Shift

Do not enlarge until you have to, and then don't do it. It is better to put on a night shift. All the great managers have found that a night shift on machines, with a good hustling foreman, is a gold mine. A night shift doubles the output with little increase in the overhead expense. At night three-fourths of the people and material things that make the overhead expense are asleep and therefore are of no expense to the firm.

The night shift may also increase the output 75 per cent. To make this increase by day work would require a large outlay of money, which means additional interest and depreciation charges. Night men require 25 to 30 per cent. higher wages than day men. Fix the pay so that men will wish to work on the night shift.

The output per man, at night, should be greater than in the day, because only the modern high-power big-output machines are run at night. The men work longer hours, 6 p. m. to 6 a. m., with no shutdown for the midnight meal if this happens to come while the machine is taking a big, long cut. The men are drawing the highest wages in the plant and are not likely to shirk.

It does not pay to run a night shift more than five nights a week. A night shift cannot be used in assembling, for quality will suffer. In the foundry it pays to run a pouring gang and shake-out gang at night.

The output of a plant is controlled by the machine department. All other departments are flexible. Enlarge this gateway and you have increased the whole plant capacity. A plant rushed to the breakdown point, the foremen crowded with work, and each workman with ten jobs waiting to get into his machine is in the most desir state.

Cutting labor cost is not of the first importance if it means cutting wages. A high output per man, even with high wages, will reduce the cost per piece and enlarge the capacity of the shop. The good manager will seek to attain this end, for that is the pathway to profits.

Engaging Heavily in the Fuel Oil Trade

The United States Asphalt Refining Company, 90 West street, New York, is perfecting plans which will enable it to go heavily into the fuel oil trade at an early date. Through an allied organization, the Inter-Ocean Transportation Company, the company above named will next year have 12 steamers carrying crude oil from Mexico to the United States, now having two in this service. The crude Mexican material is a heavy oil with an asphaltum base and high in heat value. The immediate prospect of this oil becoming an important factor on the Atlantic seaboard follows the expenditure of millions for development in Mexico by various companies.

Richard D. Upham, vice-president United States Asphalt Refining Company, speaking of the fuel oil situation as reported from the West, thus expressed his views: "The price of fuel oil is going to advance everywhere and consumers should make contracts for as long a period as they can instead of waiting for the price to come down." The products of his company include Aztec asphalt, which is a product of bitumen base petroleum, and road binders, as well as fuel oil. The use of oil on roads with the expanding employment of the automobile has become a business of very large proportions, with a corresponding influence on the oil situation. With regard to the higher prices expected to obtain for oil fuel, Mr. Upham and other oil men assert with emphasis, as do engineers interested in engines of the Diesel type, that even if fuel oil commands higher prices it will not retard the advancement in the use of such engines for the reason that their economy of oil consumption is so great.

The Battleship New York Launched

The superdreadnought New York was successfully launched at the New York Navy Yard in Brooklyn, October 30, in the presence of the President of the United States, the Secretary and the Assistant Secretary of the Navy, the Commander-in-Chief of the Atlantic, the Governor of New York and numerous other persons prominent in the political, business and social life of America. The general dimensions and features of the New York are as follows:

Length of water line, 565 ft.
Breadth, extreme, at water line, 95 ft. 2⅝ in.
Mean trial displacement, 27,000 tons.
Mean draft, 28 ft. 6 in.
Total coal bunker capacity, 2850 tons.
Total fuel oil storage, 400 tons.
Speed on trial, not less than 21 knots.
Main battery: Ten 14-in. 45 caliber rifles; four submerged torpedo tubes (21 in.).
Secondary battery: Twenty-one 5-in. rapid-fire guns, 51 caliber, four 3-pounder saluting guns; two 1-pounder semi-automatic guns for boats; two 3-in. field pieces; two machine guns, 30 caliber.

The machinery consists of triple expansion engines of 28,100 designed hp., driving two propellers and 14 Babcock & Wilcox boilers in four boiler rooms. The vitals are protected by heavy armor. Commander John E. Baily is naval constructor in charge of the building of this battleship, the greatest the Government has undertaken to build.

Jarring and Turn-Over Molding Machine

For the requirements of molding such patterns as pistons, piston rings and similar work it has been found advantageous to use a machine which combines the principles of both jar ramming and turning over. Such a machine has been designed and is now being placed on the market by the International Molding Machine Company, Chicago, Ill. The general character of the machine and the manner in which the difficulties previously attendant upon such a combination of features have been overcome are shown in the accompanying illustrations.

The machine consists of a main frame or stand, a turn-over frame or pattern carrier and a crank, the function of which with its adjacent parts is to release the mold from the pattern after it has been turned over and to support it in the proper position ready for lifting off. The jarring section consists of two heavy castings, a piston and a table that are cast together and a cylinder. There are no pipe connections, bolts, screws or other parts to work loose. The machine has a valveless control, the action being effected by a groove of proper shape and arrangement operating in conjunction with certain port holes in the cylinder. The plunger is single acting, the air pressure on one stroke acting against a vacuum.

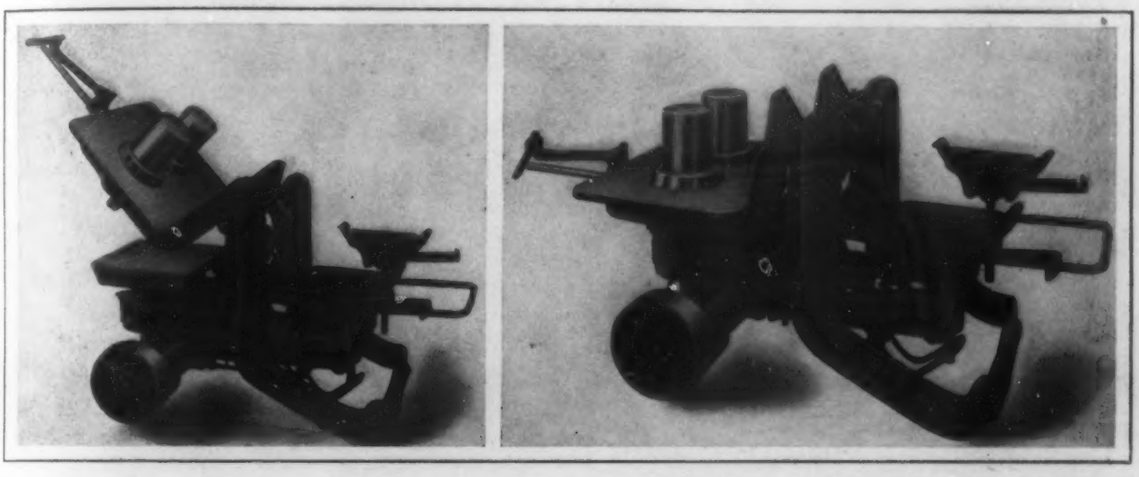


Fig. 1—View Showing Jarring Section and Knock-Out Arm

Fig. 2—Jarring Plate Stationed on the Table of the Jarring Section

Two Views of a New Combination Jar Ramming and Turn-Over Draw Molding Machine Made by the International Molding Machine Company, Chicago, Ill.

Machines combining the jar ramming and pattern drawing features have embodied the disadvantage of subjecting the movable and adjustable parts to the vibration of the jarring section during the ramming of the mold with a consequent loosening of those parts of the machine. In the machine illustrated herewith this difficulty has been avoided by completely disconnecting the plate which rests on the table of the jarring section from the turn-over frame while the flask is being rammed. The locking and releasing mechanism by which this is accomplished consists of a steel sliding lever with rollers fitted to the turn-over frame, a slotted pin which is fastened to the jarring plate and a knock-out arm, shown prominently in Fig. 1. This mechanism is so located that when the turn-over frame is being lowered to the position illustrated in Fig. 2, the roller on the sliding lever is engaged by the knock-out arm and drops down into the slot thereof, causing the lever to slide forward and become disengaged from the pin which had previously held the plate and the frame firmly together. In the illustrations the patterns are shown attached to the jarring plate, but in actual use a regular pattern plate is used and this plate is fastened to the jarring plate so that only one set of locking and releasing mechanisms is required for each machine.

The two telescoping columns in the center, in which the parallel steel uprights travel, while the foot lever is being lowered in releasing the mold, are brass bushed throughout their entire length. The effect of this construction is to provide an extremely long bearing surface. A set of highly tempered extension springs for counterbalancing the weight when turning over is attached to the turn-over frame at one end and to a stationary steel shaft in the rear of the machine at the other. These springs are fitted with eye bolts having right and left hand threads and the tension can be rapidly adjusted in accordance with the weight to be turned over. Another set of springs attached at one end to the crank and at the other to the cross-rail of the machine stand, is provided to support the weight of the mold when it is placed on the receiving table and to automatically raise it to a convenient hight for the molder to lift it off after it has been released from the pattern.

The two sets of stops or bearings, provided to limit the movement of the pattern frame when it is turned over, are so machined as to locate the plane of the pattern at the proper angle to secure a perfect draw. For clamping the bottom board and mold to the turn-over frame, an adjustable flask rod is fitted to the steel shaft on which the turn-over frame revolves. Adjustments are provided to accommodate the machine to the variations in bottom boards and depths of flasks. The working surfaces are carefully protected from sand and the center columns which engage the steel uprights have been raised above the floor level.

The machines illustrated are operated by hand in turning over and releasing the pattern, but where the mold is too large to be handled conveniently in this manner, the machine is equipped with air cylinders, a large one in the center to turn the mold over and smaller ones located at each side for drawing.

National Founders' Convention.—The sixteenth annual convention of the National Founders' Association will be held at the Hotel Astor, New York, Wednesday and Thursday, November 20 and 21. The annual banquet will be on Wednesday evening, November 20. The usual meeting of the administrative council will be held at the same place on the day preceding the convention.

The Oklahoma Tripoli Company, 302 Broadway, New York, owner of what is claimed to be the largest deposit of pure tripoli in the world, is preparing to erect a mill on its property at Peoria, Okla., for the manufacture of all classes of tripoli products. The plant will represent the most advanced ideas in machinery, methods and labor-saving devices. It proposes to be ready to offer the manufactured article to the trade within 90 days.

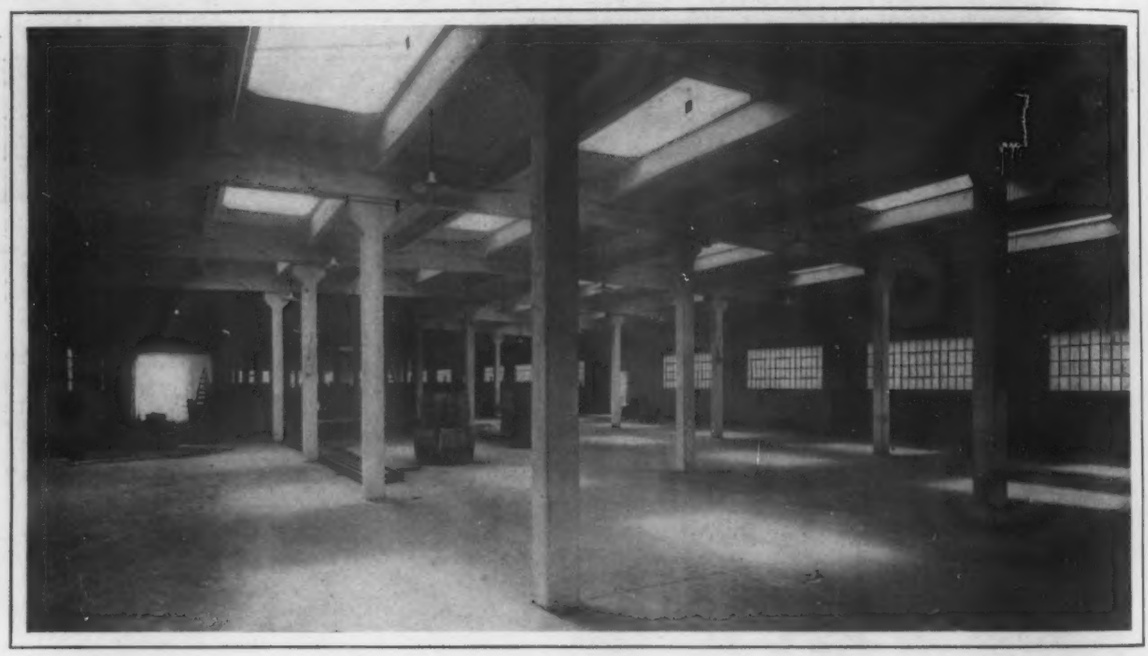
The Henry A. Hitner's Sons Company, Philadelphia, Pa., has purchased the real estate and plant of the late Wilmington Iron Company, Wilmington, Del., sold by the Equitable Guarantee & Trust Company, as trustee. It is possible that the site of the plant will be used by the buyer as a scrap yard. The rolling mill equipment has been resold and will be removed and remodeled.

A Recent Type of Factory Construction

Molded Concrete Columns, Girders, Wall and Roof Slabs and Sawtooth Frames Assembled at the Site to Form the Building

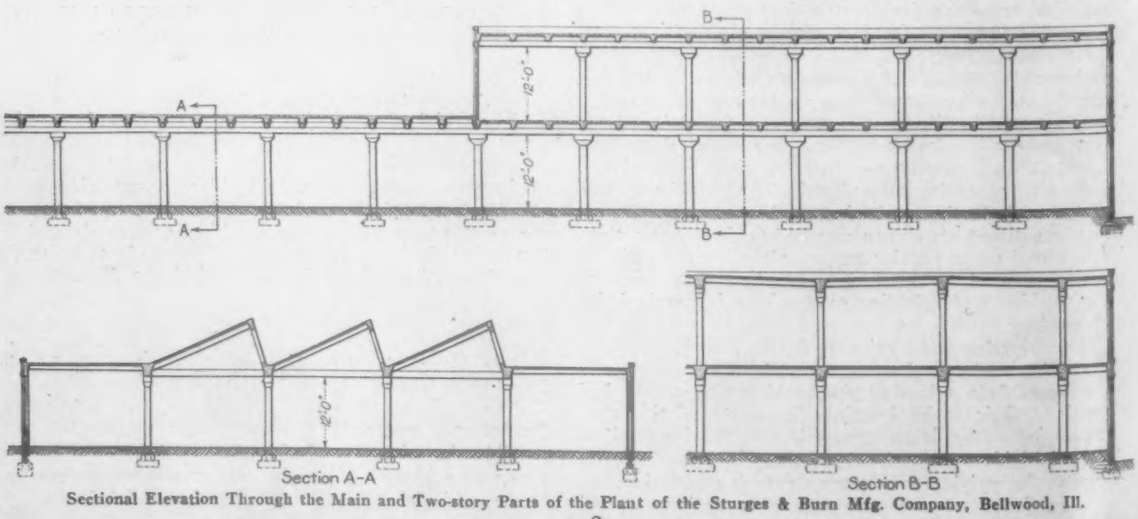
Few manufacturing buildings are erected in which any certain type of construction is consistently adhered to throughout, even though the desired qualities of immunity from fire loss, depreciation or defective lighting are correspondingly sacrificed. Considerations of cost are continually interfering with the choice of that which is desirable, suggesting the materials and forms of construction that are expedient. In some instances this lack of consistency defeats the very object, for the accomplishment of which large expenditures have been made in other directions.

The so-called Unit Bilt sawtooth factory is a recent and unique type of manufacturing building and is the latest development of the unit construction methods that have been used by the Unit Construction Company, St. Louis. Sawtooth roofs of reinforced concrete construction, constructed under the old method of putting up forms and then filling them with concrete, have been used only to a limited extent on account of the cost. Substitutes such as metal lath plastered on both sides have been resorted to for this portion of the work. In fact, some builders, owing to the cost of construction, have used wood construction for the sawtooth portion though the rest of the building is made of reinforced concrete. When lath is used it is most often carried on unprotected steel trusses, a construction of little fire resistance.

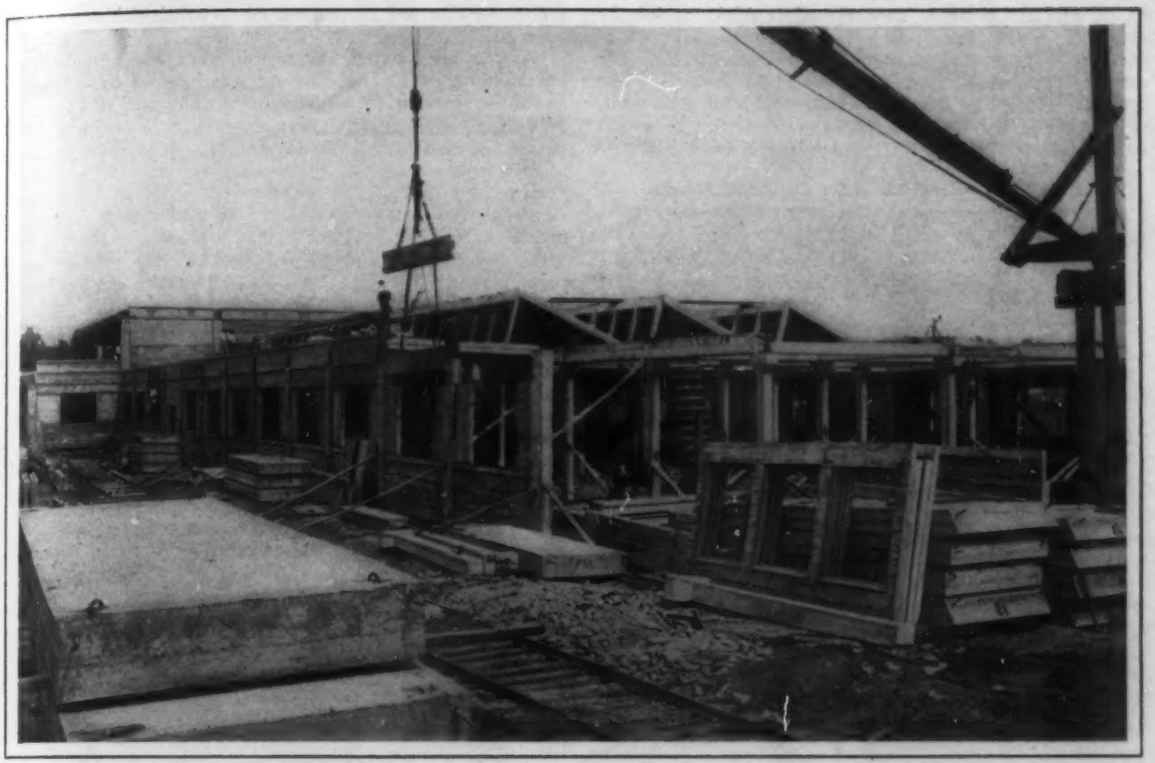


The Lighting Effect in the Tin Plate Inspection Warehouse of the National Enameling & Stamping Company, Granite City, Ill.

The full sawtooth construction used for the buildings for the Sturges & Burn Mfg. Company, which will be described later, is a development of the isolated sawtooth type, first used in the construction of a tin plate inspection warehouse for the National Enameling & Stamping Company at Granite City, Ill. An accompanying illustration, showing the interior of that building, gives a good idea of the lighting effects. In the skylights, which are constructed entirely of concrete and wire glass, the glass is placed at a flatter angle than is usually employed in



Sectional Elevation Through the Main and Two-story Parts of the Plant of the Sturges & Burn Mfg. Company, Bellwood, Ill.

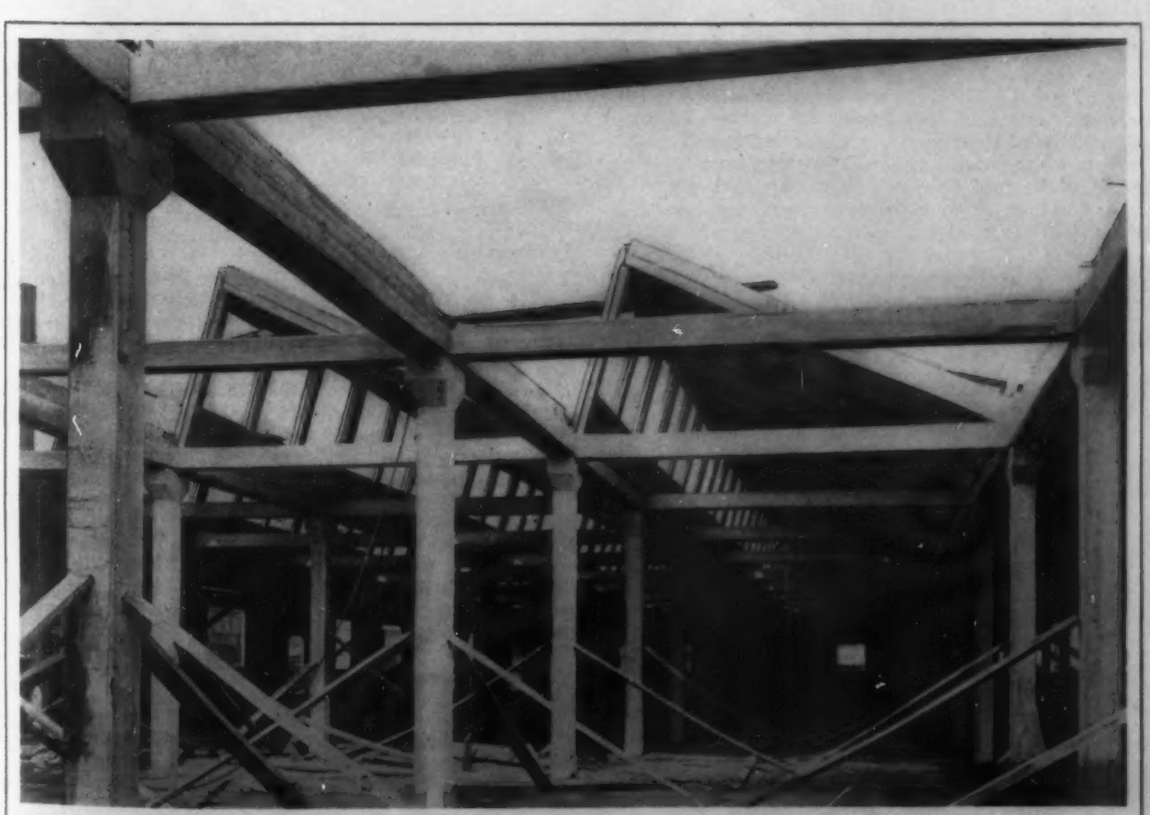


Saw Tooth Roof Frames and Roof Slabs Being Placed in Position

sawtooth construction and therefore admits considerably more light. The reinforced concrete wire glass type of skylight is permanent construction, and it has been used on various buildings, notably on the classing or f.o.b. sheds and compress buildings in the cotton handling plant of the Memphis Terminal Corporation, Memphis, Tenn., where 16 acres of unit buildings are now being constructed.

The plant of the Sturges & Burn Mfg. Company is situated at Bellwood, Ill., 18 miles west of Chicago, and comprises three buildings. The main building is 702 ft. 7 in. long and 101 ft. 6 in. wide, with a wing at the west extending back 142 ft. and a two-story wing at the east end shown by the sectional elevation. The other buildings are the tin room and boiler room.

The typical column spacing for all the buildings is



Details of Saw Tooth Construction Showing the Method of Supporting the Roof Slabs

17 ft. 6½ in. x 20 ft., and the clear hight under the beams is 12 ft. The floor is carried on an earth fill at car level. Excluding the grouted connections the only concrete that was poured *in situ* were the footings. The columns, girders, sawtooth frames, roof and wall slabs were made in the casting yard adjacent to the work and set as units. The wall slabs average 4 in. thick with

The Interior Showing the Lighting Effect

bands around openings. There is one expansion joint in the length of over 700 ft., steel rollers and plates being used to insure free movement.

Roof drainage is provided by means of cinder concrete crickets which direct the water to wrought iron downspouts placed within the columns. The details of the sawtooth construction are shown on the accompanying views taken during the progress of the work. In the foreground in one of the engravings are seen the girders and the tie beams, and a close inspection will show the reinforcing bars projecting into the grout box over the column cap. Further back are shown the inclined frames and the roof slabs which rest at their lower end on a shelf on the girder and at their upper end on a shelf in the frame; the frame itself rests on the shelf on the girder and the tie beams are intended to take the thrust of the triangle so formed. In this building the tie beams have also been designed to carry shafting and malleable iron inserts have been cast in to facilitate the connection of shaft hangers, etc.

The skylight frame, as will be noted, consists essentially of a large flat plate into which the window frames were cast, extending from column to column. The lower end is detailed to rest on the girder ledge with projecting bars which overlap projecting stirrups from the girder and from the roof slabs resting on the other side of the girder. Three or four inches of grout on top of the girder forms the valley and completes the connection.

The Finished Saw Tooth Construction

At the top the frames are notched to provide a shelf for the support of the roof slabs; this is shown in another of the illustrations, where the projecting bars from the roof slabs and frame can be seen. The roof slabs themselves are of the patented type generally used by the contractor and there are three roof slabs to each panel. All the units were set on mortar beds to insure proper bearing and the connection grouted with a 1:1½:2 concrete.

As has been stated, the casting yard was adjacent to the building site. The concrete was handled by a tower and three chutes in the usual manner. The yard was served by a McMyler locomotive crane with a 48 ft. boom, which picked the units from the forms and placed them in the storage pile, or, as was the usual case, on flat cars, and then pushed the cars to the erecting derrick. The traveler consisted of a stiff-leg derrick with a 76-ft. trussed boom, carried on a square tower 20 ft. high; the tower was carried on trucks with flanged wheels running on regular track. Erection was started at the east end of the main building, the traveler setting the full width of the building and backing away as the work progressed; after the main building was set the traveler was again moved to the east end, completing the east wing, the boiler house, tin room and west wing successively.

Some idea of the rate of progress may be gained from the fact that the erection of the units in the main building proceeded at the rate of one bay per day, which meant 18 ft. of building, 100 ft. wide, per day. The boiler house was set in two days and the tin room in three days. When it is remembered that the tin room covers an area approximately 100 x 160 ft., the speed of erection may be understood.

The general plans of these buildings were prepared by the owners for covered wood and brick construction. The reinforced concrete design finally adopted was prepared by the Unit Construction Company, which also carried on the construction work.

Customs Decisions

Printing Presses

The United States Board of General Appraisers reversed the collector at New York in assessments made on collotype or photogelatin printing presses imported by D. H. Burnett. The machines were classified as "manufactures of metal" under the present tariff act, and duty taken at 45 per cent. ad valorem. The importer asked that the machines be admitted at 30 per cent. ad valorem under the paragraph for "printing presses." The claim is sustained.

Charcoal Iron Blooms

A protest by J. H. L. Todd regarding the classification of iron blooms, in the manufacture of which charcoal is used, was decided adversely to the importer. The merchandise was assessed at $6 per ton under the final proviso of paragraph 120 of the act of 1909. Several claims for lower duty were made, but they are held to be without merit.

Iron Ladles for Molten Metal

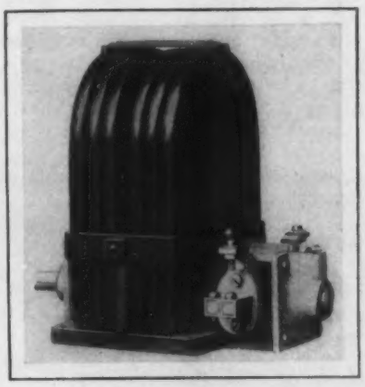
The board has overruled a protest filed by the W. Bingham Company regarding the classification under the tariff act of 1909 of iron ladles used in the handling of molten metal. They were returned for duty as "manufactures of metal," at 45 per cent. ad valorem. It was alleged that the articles are "forgings of iron, not machined, tooled or otherwise advanced in condition," and as such entitled to enter under paragraph 123, at 30 per cent. A sample of the goods was produced, but no evidence submitted. In overruling the claim, Judge Fischer says it is impossible to determine from the sample how the ladles were made.

The annual meeting of stockholders of the Pittsburgh Steel Company was held in its general offices in the Frick Building, Pittsburgh, last week, at which the retiring members of the board of directors were re-elected, as also were the officers as follows: Wallace H. Rowe, president; John Bindley, vice-president; C. E. Beeson, secretary, and W. C. Reitz, treasurer.

The final bulletin on "Comparative Fuel Values of Gasoline and Denatured Alcohol in Internal-Combustion Engines," giving the results of more than 2000 tests, has just been issued by the United States Bureau of Mines, Washington, D. C. R. M. Strong and Lauson Stone are the authors.

Electro-Magnetic Speed Indicator for Shafting

To provide a speed indicator which would be universal in its application the Holtzer-Cabot Electric Company and the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., working in conjunction, have developed an interesting type of electro-magnetic speed indicator. This indicator can be used to measure vehicle, machinery and shafting speeds at any time and can be used interchangeably for any of these. In the design of the indicator advantage is taken of the fact that the voltage of an electric generator varies directly as the speed with a constant magnetic flux cutting the armature conductors.



An Interesting Type of Electro-Magnetic Speed Indicator for Shafting and Machinery Made by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

The indicator consists of a magneto generator manufactured by the Holtzer-Cabot Electric Company, Brookline, Mass., and especially designed for use with any of the very large line of direct-current meters of the Westinghouse company. The magneto is attached to a pulley or shaft of the apparatus, the speed of which is to be measured. As the voltage of the magneto is proportional to its speed, the meter when properly calibrated will indicate the speed directly at any time. The voltage of the generator when operating at 1000 r.p.m. is 25 volts, so that the meter can be calibrated for any unit such as revolutions per minute, feet per minute, cycles per second, or percentages either fast or slow of any of these quantities. It is not necessary that the meter be located adjacent to the indicator and this feature makes it possible to group a number of meters in one place so that the efficiency of the work in the various departments at any time can be readily seen by the officials in charge. One of the applications of the meter is in connection with printing presses, where the number of copies being printed at any time, or the total number of any edition is to be noted. Another use of the indicator is to determine the speed of trains or electric cars. When employed for this purpose the indicator is attached to the axle and with the meter adjusted to prevent jar, it is pointed out that excellent results have been secured.

If a complete record of the operation of any machine is desired, this can be secured by using a graphic meter. This will enable records to be secured where a test of the efficiency of a piece of apparatus is desired. On account of the small size of the indicator, its dimensions being only 6 x 10 x 10 in., it is possible to place it anywhere near the machine and a large variety of meters can be used with it.

Exactly $34,119,716.77 has been paid in benefits to employees and their families in the 26 years and 8 months that its relief fund has been operative on the Pennsylvania Railroad. In September the amount thus paid on the lines both east and west of Pittsburgh totaled approximately $200,000, of which 29 per cent. went to the families of members who died, while the remaining 71 per cent. was paid to members disabled by sickness or otherwise incapacitated for work.

An Improved Metal Slitting Machine

The special features characterizing a new metal slitting machine which has been brought out by the Blake & Johnson Company, Waterbury, Conn., are the ability to change the cutters in a minimum amount of time and the possession of marked efficiency in the slitting of steel. Accurate work is assured together with the maximum life of the cutters without any loss of efficiency. It is pointed out that the changing of cutters in a minimum amount of time is an essential feature where the output varies between different widths of stock and the accompanying engravings show how easily the change is made. Fig. 1 is a view of the machine ready to operate, while Fig. 2 was taken without changing the position of the camera and shows the arrangement of the various parts when the cutters are about to be changed.

The upper arbor is hinged on an intermediate shaft and is adjustable toward and away from the lower arbor on an arc of a circle instead of in a straight line. A bronze gear on this shaft, which is in mesh with a steel gear mounted on the arbor, drives it and this arrangement it is pointed out causes all the gears to run on their true pitch line at all times whether they are 5¼ in. in diameter as when new, or 4½ in. after they have become worn. In this way it is also emphasized there is no lost motion in the drive.

To change the gangs of cutters it is only necessary to remove two cap screws at the foot of the outboard housing and to slide the housing clear of the arbor ends. The lock pin is then released and the screw readjusted, the upper arbor being swung up and away from the lower one.

The machine is driven by a sensitive friction clutch pulley located at the front or rear of the machine or at any distance from it, the operation in the last case being controlled by a rope connection with levers. The lower arbor runs in bronze sleeves having nuts for endwise adjustment. All the bearings are bushed with bronze and the arbors are of crucible steel.

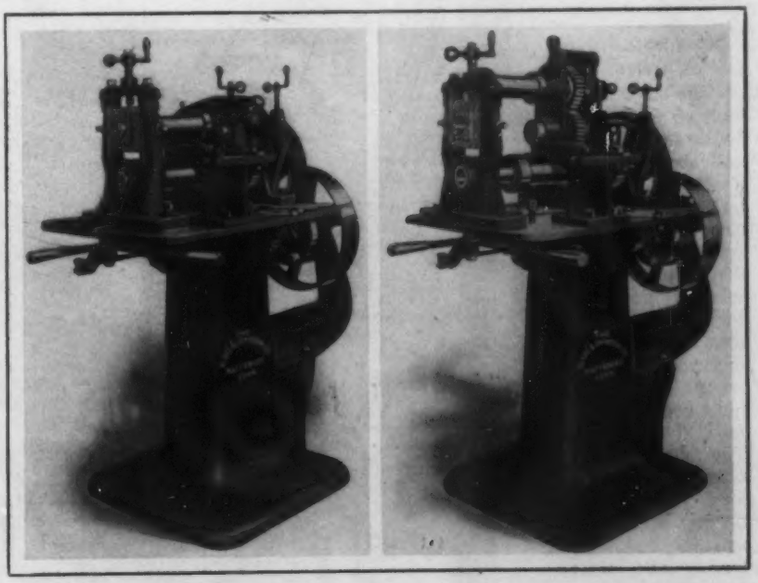


Fig. 1—Ready to Operate Fig. 2—Ready to Change Cutters

Two Views of a New Type of Metal Slitting Machine Built by the Blake & Johnson Company, Waterbury, Conn.

The friction clutch pulley is 16 in. in diameter with a 4-in. face. The ratio of the back gears of the machine is 4.2 to 1. The floor space occupied by the machine is 25 x 53 in. and the net weight is 1100 lb. The distance from the floor to the center of the lower shaft is 38½ in. If desired the diameter of the cutter arbor which is regularly 2⅝ in. can be changed.

A party of 125 members of the Engineers' Club and the Associated Engineering Societies of St. Louis will be the guests of the construction engineer of the Keokuk hydro-electric plant, Hugh L. Cooper, next Saturday and Sunday. The party will make the trip on a special train.

Tests of a Boiler 24 Tubes High*

Regular Service Operation of a 1000-hp. Water-Tube Steam Boiler

BY B. N. BUMP†

To determine by test and by continuous operation in the regular service of a large plant, the advantages and disadvantages of a high boiler of the Babcock & Wilcox type, tests were made from November, 1911, to February, 1912. They were expected to answer the following questions:

a At what rating will the highest efficiency be obtained?

b Will the superheat obtained, with the superheater located above the 24th tube, be sufficient to pay for the installation of the superheater?

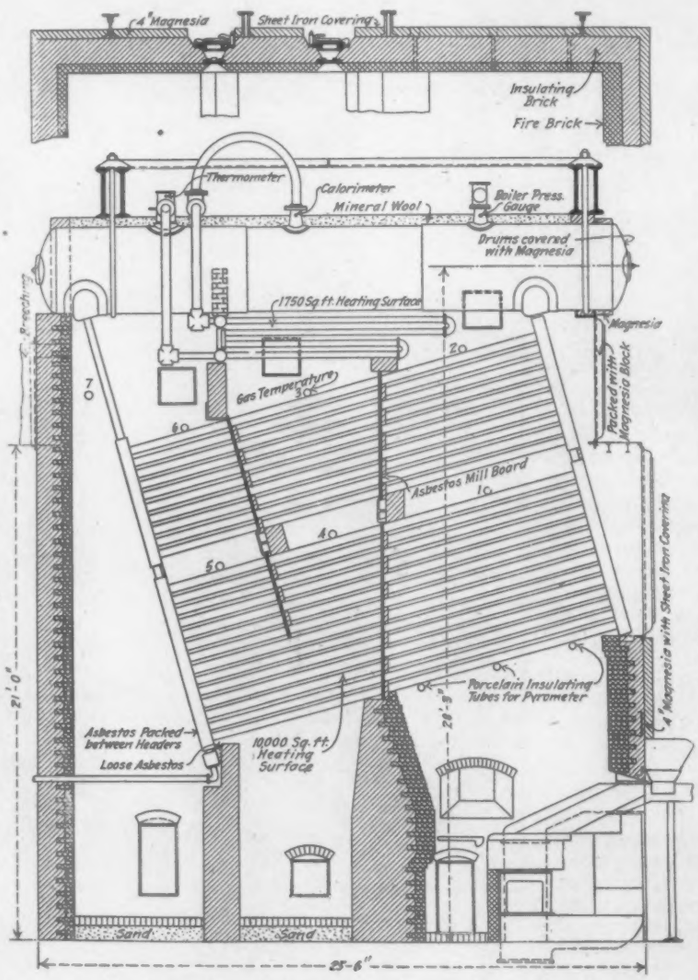
c Will the last pass of the boiler be effective?

d Can the exit gas temperature be reduced very nearly to the temperature of the steam in the boiler?

e If the exit gas temperatures are close to the steam temperature, will pitting occur in the back end of the boiler due to the sulphur content of the gas?

Boiler and Superheater

The boiler was built up of one regular 14-tube section and above this, with a space of some 11 in. between them, was placed a 10-tube section. The headers of the 10-tube and 14-tube sections were joined by short nipples, making a 24 high header. There are 21 of these sections containing a total of 504 tubes. The tubes are 4 in. in diameter, and 18 ft. long. There are 3 drums 42 in. in diameter, and 24 ft. long. The water heating surface of the boiler is 10,000 sq. ft. Between the top tubes and the drums a Foster superheater is placed containing 1750 sq. ft. of superheating surface.



Section Through a 1000-hp. Babcock & Wilcox Boiler 24 Tubes High

The gases make three passes through the boiler. The baffles are arranged to give a gradual decrease in space through the first and second passes in the direction of flow, which tends to maintain the velocity of the gases as the temperature decreases. The gases enter the superheater from the top of the first pass, after traveling over 24 tubes. From the superheater they turn downward through the second pass; upward through the third pass, and then make their exit between the downtakes, and through the rear wall to the stack. The spaces between the header, both front and rear, were packed with asbestos.

Wind Box in Connection with Stoker

The boiler is fired by a six-retort Taylor stoker, grate area 62.465 sq. ft., not including any dump grate area. The ratio of boiler heating surface to grate area is 160 to 1. The ratio of boiler plus superheater surface to grate area is 188 to 1.

The hight of the combustion chamber is about 6.5 ft., and the width of the furnace 12 ft. 7 in., which latter is greater than the width of the stoker to allow for placing a cast-iron wind box on either side of the stoker. This is believed to be a new feature, tried as an experiment. Previously there had been trouble from the formation of clinker on the side walls with stokers of both the underfeed and overfeed type, owing to some coals giving a tough sticky clinker which is very troublesome. With the side walls against the stoker, clinker forms rapidly, and is difficult to remove. Setting back the side walls lessens clinker formation to some extent, and facilitates the removal of the clinker.

A brick ledge between the stoker and side wall is objectionable, because in time clinker will fasten to it and it is almost impossible to get a bar between clinker and ledge. The cast-iron wind boxes overcome the objections to the brick ledge by chilling the clinker so that it does not stick. A bar can always be forced between the clinker and wind box to raise the clinker. A part or all of the air from the blast fan is passed through these wind boxes on its way into the stoker. After six months of continuous service there is no sign of burning on the wind boxes.

The accompanying cut shows a sectional elevation of the unit. The locations of the pyrometer rods and gas sampling tubes are shown. The furnace temperatures were taken through the three openings shown just under the lower tubes. The other gas temperatures were taken at positions 1 to 7 inclusive.

The walls were lined with 9 in. of fire brick backed up by 9 in. of porous insulating brick. The outer surfaces of all walls were painted with two coats of boiler pitch to prevent any filtration of air through the brick work. Against these painted surfaces of the front and side walls 85 per cent. magnesia covering 4 in. thick was placed. The magnesia was held against the brick and protected by a thin steel shell. Asbestos board was placed on the top half of the drums, then loose mineral wool was placed over the entire top of the boiler.

The tests varied from 18 to 48 hr. in length, although most of them were about 24 hr. long. The coal was weighed in a wheelbarrow on scales tested frequently for accuracy. A small sample of coal was taken from each wheelbarrow load to make up the test sample for moisture, analysis, and calorific value. The first 19 tests were made with mixed coal, from four different mines all in the same region. Tests Nos. 21 to 40 were all run on coal from No. 29 mine, lighter than that used on the early tests and giving much less clinker trouble. It

*From a paper printed in the Journal for October of the American Society of Mechanical Engineers.

†Engineer of Tests, Solvay Process Company, Syracuse, N. Y.

made a loose fuel bed and allowed more boiler capacity with less draft in the stoker. For best combined efficiency the dry coal per square foot of grate per hour is about 26 lb., or nearly 270 lb. per retort. The quantity of coal burned per square foot of grate per hour was increased to nearly 63 lb. with a decrease in combined efficiency of 5.5 per cent.

Summary of Results

a The best combined efficiencies are obtained with 56 to 66 per cent. of the boiler rating. The efficiencies fall off slowly as the quantity of steam generated is increased. The extreme variation in efficiency shown by the individual tests is from 75.2 to 81.3 per cent.

b The gain in efficiency due to the superheater seems to bear no definite relation to the amount of moisture in the steam entering the superheater. By gain in efficiency due to superheater is meant the heat absorbed by the superheater in percentage of the total heat in the coal. The superheat shows a general tendency upward with the increase in boiler rating. For 60 per cent. of the boiler rating the superheat is about 36 deg. F. and for 120 per cent. rating about 74 deg. F. At 60 per cent. rating the weight of steam passing through the superheater is 18,000 lb. per hour, the amount for which the superheater was built. The pressure drop through the superheater for its rated quantity of steam is 5 lb.; at 120 per cent. boiler rating the weight of steam passing through the superheater is double that for which the superheater was designed, and the pressure drop through superheater is 28 lb.

c At the low boiler ratings the last pass of the boiler, and in fact the last two passes, are of very little use. The best combined efficiencies were obtained when running between 56 and 66 per cent. of boiler rating. At these low ratings the drop in gas temperature through the second and third passes altogether is about 20 deg. F., and the heat absorbed is very small, about 1.3 per cent. of the total. These two passes have 50 per cent. of the boiler heating surface. If the second and third passes were dropped off entirely, the loss in combined efficiency would be about 1 per cent. at the low rating. It is only when the boiler has reached 75 per cent. rating or more that the gain in economy in the last two passes is sufficient to give a reasonable return upon the investment in heating surface. While the exit gas temperatures were reduced almost to the lowest theoretical limit which can be reached without the use of an economizer, it was done at a large expenditure in heating surface.

d When running at about 50 per cent. of boiler rating the temperature of the gases leaving the boiler is practically that of the steam in the boiler. As the capacity is increased the difference between the temperature of the gases leaving the boiler and the temperature of the steam in the boiler increases. The increase in the difference between these two temperatures seems to be approximately in the same ratio as the increase in capacity, so that for an increase from 50 to 100 per cent. of the boiler rating the difference in temperature between exit gases and steam increases about 50 deg. F.

e An examination of the boiler after more than six months' service showed no evidence of pitting of the heating surface of the last pass due to the sulphur content of the coal and low exit gas temperature.

The paper in its entirety contains of course the detailed tables, analyses and other data commonly supplied with extended steam boiler tests.

Large Motor-Driven Pit Planing Machine

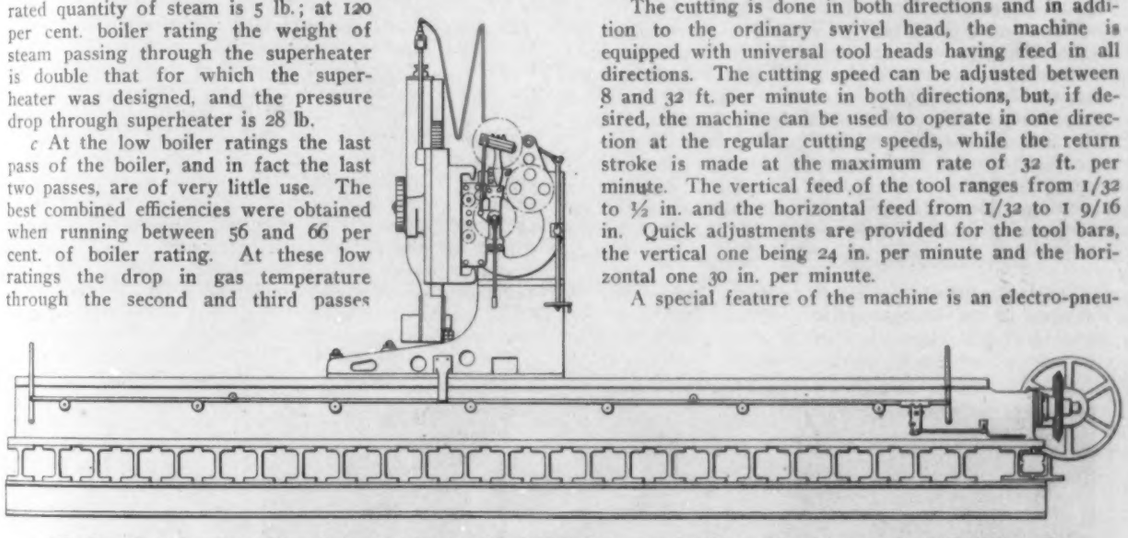
At the present time the Bethlehem Steel Company, South Bethlehem, Pa., is building one of the world's largest planing machines in its shops. The work which this machine will be called upon to do is the planing of armor plates and it will accommodate surfaces not exceeding 21 ft. in width and 24 ft. in length. The special features of the machine are an electro-pneumatic balance arrangement for the tool head, massive construction and the use of the first 100-hp. reversing electric motor built in this country for driving.

The base to which the work is fastened is made from specially rolled Bethlehem H sections, which gives practically a forged steel bed. Some idea of the magnitude of the machine can be gathered from the fact that there are over 200 tons of these sections in the base. The cross-rail is made of cast steel and the tool heads are of cast steel throughout to enable the machine to perform the very heavy service which is expected of it.

The machine is electrically driven throughout and will be equipped with a 100-hp. reversing motor. This motor which is said to be the first of its kind turned out in this country is being built especially for this machine by the General Electric Company. The drive is of the screw type with the screws running in oil at all times.

The cutting is done in both directions and in addition to the ordinary swivel head, the machine is equipped with universal tool heads having feed in all directions. The cutting speed can be adjusted between 8 and 32 ft. per minute in both directions, but, if desired, the machine can be used to operate in one direction at the regular cutting speeds, while the return stroke is made at the maximum rate of 32 ft. per minute. The vertical feed of the tool ranges from 1/32 to ½ in. and the horizontal feed from 1/32 to 1 9/16 in. Quick adjustments are provided for the tool bars, the vertical one being 24 in. per minute and the horizontal one 30 in. per minute.

A special feature of the machine is an electro-pneumatic balance arrangement for the tool head. In this device the tool holder is balanced by an air cylinder formed in its upper part. There is a stationary piston for this cylinder and the inlet for the air which is furnished by an air compressor plant bolted on the top of the cross-rail is through the piston rod. An electrically-driven air compressor supplies air to a storage tank, from which it is pumped to the tool holder cylinders.



Side Elevation of a Large Motor-Driven Pit Planing Machine Built by the Bethlehem Steel Company, South Bethlehem, Pa.

Owing to the scarcity and high prices of heavy steel scrap, the Pittsburgh Steel Company is now using about 75 per cent. pig and 25 per cent. scrap in its open hearth furnaces at Monessen, Pa., and its consumption of pig iron is, therefore, much heavier than usual. The company expects to have one of its two blast furnaces, now in course of erection, ready for operation in April and the other about May or June.

Fried. Krupp, Aktiengesellschaft, Essen-on-the-Ruhr, Germany, has acquired the patent rights of the acid-resisting iron alloys invented by Professor Borchers of Aix-la-Chapelle. Those who desire to secure information regarding these alloys should communicate with the company. The composition of the alloys was described in *The Iron Age* of August 22, page 397.

The Society of Naval Architects and Marine Engineers will hold its twentieth annual meeting in the Engineering Societies Building, 29 West Thirty-ninth street, New York, November 21 and 22.

New Construction for Blast Furnaces

The Weight of the Whole Furnace Carried on Framework Supported on Four Columns Set Well Out from the Stack

A paper presented by J. E. Johnson, Jr., at the Cleveland meeting of the American Institute of Mining Engineers, last week, gave an account of the new style of construction employed in the recent rebuilding of the Ashland, Wis., blast furnace of the Lake Superior Iron & Chemical Company. Mr. Johnson is manager of this furnace, and the plan was originated and carried out by him. We give below a synopsis of the paper:

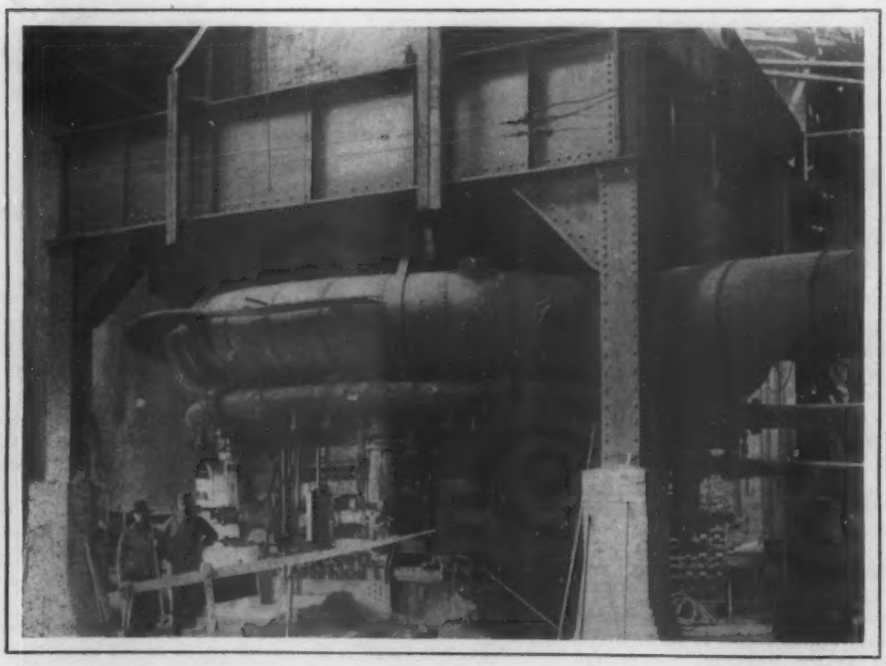
The general construction of blast furnaces has undergone no radical change in more than a generation. When the old style of masonry construction was replaced by the steel shell, the masonry piers were simultaneously replaced by columns never less than six and frequently 12 or 16 in number, set under the mantle ring. These columns were at first unvaryingly made of cast iron, but in more recent years have frequently been made of structural steel.

The furnace itself has recently been the subject of radical changes. In some cases the thin-lined construction has been adopted for the whole furnace, and in other cases has been adopted for a zone immediately above the bosh, raising the mantle several feet to make this possible, but still the style of construction with columns set immediately under the mantle has been universally followed. In spite of the apparent permanence of this type of construction it is open to grave disadvantages from the operating point of view.

Objections to Usual Column Construction

The bustle pipe is necessarily outside the columns, as the slope of the bosh and size of the crucible are such as to leave but little room inside the columns for the necessary water piping, etc., consequently the penstocks have to pass between the columns. Moreover, the hearth jacket requires a diameter but little smaller than the circle of the inside of the columns, and as a result the cooling-water ditch for protection against breakouts is exceedingly limited in width. As a consequence of these conditions, when any work requires to be done around the furnace such as changing a tuyere or working on the cooling-water pipes, the amount of room left by the columns, penstocks and water pipes is more conspicuous by its absence than by its presence. Moreover, if a breakout occurs the ditch is filled with iron, perhaps half way around the furnace or more. This locks itself in between the columns and the hearth jacket in a way that not infrequently makes impossible its removal while in blast.

Another result that not infrequently has followed breakouts is the burning and cracking of the columns by the molten iron and cinder surrounding them. Again, the space between the base of the columns and the hearth jacket being so small, the whole structure is necessarily set on one foundation and the continual expansion, which all masonry structures undergo from continued heating, gradually pushes the column bases out.



New Column Construction for the Rebuilt Furnace of the Lake Superior Iron & Chemical Company, Ashland, Wis.

Objects of the New Construction

It has seemed to the author for several years that it would be possible to avoid these evils by building a framework of structural material strong enough to carry the weight of the whole furnace and supporting this on columns set at the corners of this framework, which would throw them so far back from the furnace proper that they would be safe from all danger from breakouts or other accidents, and at the same time would allow room enough around the furnace for necessary access to all parts with great safety, ease and speed in all necessary work; and that if the ditch became filled with iron, this would be unable to lock itself around the columns, and, being free on one side, could readily be removed.

When an investigation concerning the quality of charcoal iron had indicated the desirability of reconstructing Ashland furnace to obtain the lines needed, the construction shown appeared to be so practicable from an engineering standpoint and so desirable from an operating standpoint that it was finally adopted.

Structural Features

The paper tells why four-column construction was adopted instead of three columns, as at first proposed, and why thin-lined construction for several feet above the bosh angle, letting the mantle at the top of this thin zone rest directly on the girders, was finally rejected. In order to raise the girders above the bustle pipe and at the same time avoid the high mantle possible only with the thin-lined zone above the top of the bosh it was necessary to support the shell on the girders by brackets. In order to reduce as far as possible the local stresses on the bottom of the shell, due to these brackets, eight of them were used. This also had the advantage that by spacing the brackets so that the centers of the girders came half way between them the load on the girders was applied relatively close to the columns and the bending movement much reduced. At the same time, the distance from the shell to the center of bearing on the base of the brackets was increased but little over what it would

have been had they come on the center of the columns. Obviously the mantle plate would be entirely unsupported except at its outer edge and it might deflect at the inner edge, owing to the weight of the brickwork, if some provision were not made to prevent this. A cantilever bracket was therefore designed to support the mantle plate from below to within a short distance of its inner edge. Four independent piers of concrete were provided, set back at a great distance from the foundation of the hearth of the furnace proper. These piers are at such a distance from the foundation of the hearth and so entirely separated therefrom that it is considered impossible there should ever be any transmission of the expansion of the hearth through the soft dirt between the two, which could force the piers out of position. Details are given of the brackets introduced between the top of the column and the bottom of the girder on each corner, also of the eight brackets which support the shell on the girders. Extra provisions for strength were made because of this being an initial installation. The girders were designed to be safe with a low unit stress, assuming that the weight of the shell, top rigging and top house, of the lining, back lining, bustle pipe and the entire charge from the hearth to the stock line was supported on them. While this last condition is most unlikely, it was conceivable that the furnace might become so badly scaffolded just above the tuyeres that the weight of the whole charge would come upon the mantle and so upon the structural work.

Expectations Realized

The general appearance of the furnace in operation is shown by the illustration. Two men stood shoulder to shoulder as nearly in line as they could be placed between the wicket on the penstock and the nearest column, in order to show the amount of room available. Further, this tuyere is not in line radially with the column, so that the access to the tuyeres is even more unrestricted than would be indicated by the view given.

The author states that the accessibility of the furnace for work of any kind is remarkable and such that no one who had worked around a furnace of this design would ever desire to return to the old type of construction.

The Question of Cost

Taking up the objection that this type of construction is costly, the author says that the saving in cost over the standard construction is really the feature that gave most satisfaction. The first cost of the four-column construction was less than $2,000 in excess of that of the standard construction, but of this saving about $1,000 would have been wiped out by the cost of work on the bustle pipe had the management adopted the old construction. In order to get the furnace lines desired with the standard construction it would have had either to provide a new bustle pipe complete or cut the present one down, cut it in two in six places and insert rings to increase its diameter and reline it complete, which could scarcely have been done for $1,000.

If the standard construction had been employed the old columns would have had to be removed and the whole foundation exposed before the new foundation could be added. As it was, not only the foundations were built, but the structural work for the new furnace was erected by the time the bosh and the upper part of the lining of the old furnace had been torn out. A saving of from two to three weeks in time on this account alone is estimated.

The furnace is 60 ft. high and of a size making 200 to 300 tons a day possible with moderate driving on coke iron. The weight of a coke furnace, figured on this basis, would not exceed 2000 tons, and there is no difficulty in carrying such a load with the construction indicated.

This construction, it is pointed out, lends itself particularly well to the thin-lined type of furnace, because the weight of the lining in such a furnace is an insignificant fraction of that of a standard thick lining, and because some outside structure is generally necessary for supporting the platforms, spray apparatus, etc., even if not the furnace top proper. This can all be done with great advantage from the girder frame if the type of construction described be used.

Special Economies

When the steel bosh jacket is used with the ordinary type of furnace it has necessarily to be fitted up and riveted together in several sections inside the columns, and, in fact, it is commonly attached to the edge of the mantle ring as it is put together with the necessity of a great deal of fitting of the vertical seams. Of the special savings at Ashland the author says: "In the present instance the bosh jacket was built entirely independent of the furnace and when the construction had advanced far enough to receive it it was simply shoved in through the columns, hoisted up to place and riveted fast, the entire job taking only about two days, as against two or three weeks that would have been required had it been built up in place in the customary way.

"We consider that we made easily a saving of five weeks on these two accounts alone. The loss of profits, overhead charges, etc., at such a plant can not be estimated at less than $500 a day, and this saving of 35 days, therefore, represents a saving of $17,500, or, deducting $1,000 for the excess cost over the standard construction, a net saving by the use of this construction of $16,500."

Canada's Merchant Marine

In the calendar year 1911 there were built and registered in Canada 339 vessels, measuring 27,736 tons. As during the year 279 vessels were removed from the Dominion's shipping register for various causes, there were left on the books at the close of the year 8088 vessels of 770,446 tons. Of the whole 3444 were steamers measuring 588,741 tons gross. The estimated value of all the vessels registered is $23,113,380. Roughly, 41,500 persons find employment in connection with the industry. Of the 142 registered steamships of 1000 tons or over, a large proportion is in the St. Lawrence and the Great Lakes traffic. The Emperor heads the list in size with 7031 tons gross register; the E. B. Osler registers 6787 tons gross. There are quite a number of 4000 tons gross or over.

Last year the standing of the Provinces, according to the net tonnage of both sailing and steam vessels, was: Ontario, 236,877 tons; Quebec, 193,682 tons; Nova Scotia, 142,631 tons; British Columbia, 122,264 tons; New Brunswick, 55,872 tons; Prince Edward Island, 9683 tons; Manitoba, 6373 tons; Yukon, 2708 tons, and Saskatchewan, 356 tons. The high standing of British Columbia is due partly to the fact that many of the ships of the Canadian Pacific fleet are registered there. Thus Vancouver is fourth in the list of ship-owning ports in Canada, with 45,573 tons to its credit, Victoria being second, with 65,350 tons; Toronto is third, with 57,513 tons, first place being held by Montreal with 145,274 tons.

The Connecticut River Power Company and the New England Power Company, allied corporations which are developing great hydroelectric plants in western New England, announce that projects completed or in progress will give a total of 125,000,000 kw.-hr. per annum, and that 70,000 hp. is either in operation or is soon to be available. The dam at Shelburne Falls is completed and its power house is in operation, and the power for driving electric locomotives through the Hoosac tunnel will soon be available. An important part of the system will be a great reservoir now building at Somerset, Vt., covering 6 sq. miles to a depth of 60 ft., which will be a reserve supply for equalizing the flow of the Deerfield River in times of drought. The benefit to New England industries already imparted by the development is enormous.

Imports of pig iron into Japan from the new Tata furnaces in India have been very large, and to a certain extent have driven English pig iron from the market. Although the quality of the Indian iron is said to be inferior to that of the English or even of the Chinese formerly imported from the Han-Yeh-P'ing works, importers have the advantage of $2.50 per ton in freight.

The German automobile industry shows a steady and material growth. In 1909 and 1911 the German aggregate exports were, respectively, 19,983,000 marks and 49,013,000 marks.

A New Small Revolving Steam Shovel

A new revolving steam shovel, designed particularly for the regular run of contractor's work, where a larger type of machine is not required, has been recently brought out by the Browning Steam Shovel Company, Cleveland, Ohio. This machine has a 20-ft. boom and a ⅞-cu. yd. dipper. The shovel revolves in a complete circle and the machine is self-propelling. It has standard gauge tracks and can be mounted either on traction or flanged wheels. The clearance swing of the dipper is 24 ft. and the handle is 12¼ ft. long. The machine has three engines, one for hoisting, one for rotating and a third for crowding or propelling the dipper back and forth. The capacity varies with the material to be handled. It is stated that three swings of the shovel can be made per minute. By removing the dipper and substituting another drum it is possible to use the shovel as a locomotive crane. All the operations are controlled by one man who also attends to the firing and the boiler. His position is forward in the cab where all the movements are in view and all the levers are in easy reach.

The lower base is a steel casting and the rotating one which is carried on four 10-in. wheels is 8 ft. wide. The rotating truck is strongly built of I-beams, channels and angles bolted together with connecting plates and arranged to support the machinery on the main members. The hoisting engine is used to propel the shovel by a vertical shaft geared through a crossshaft to the rear

A New Small Revolving Steam Shovel Built by the Browning Steam Shovel Company, Cleveland, Ohio

truck, the ratio of the reduction gearing being such as to give a very powerful drive. The rotating engine drives the vertical shaft, the pinion of which meshes with a gear on the lower base. The main hoist is driven through a train of spur gearing by its engine. The cylinder, guides and steam chest of this engine are cast in one piece and the cross-heads are fitted with bronze shoes. The hoist drum is operated by a separate band friction clutch that allows the load to be picked up gradually and does not permit the engine to be reversed when the dipper is being lowered. The hoist drum is of cast iron, grooved on the barrel and properly balanced. The drum hubs are bronze bushed and fitted with grease cups for lubrication. All the journal bearings are bronze bushed and have removable caps and grease cups. Open-hearth steel castings or forgings are used for all the gears and these have machine cut teeth except those on the larger sectional rotating ring gear, which are cast. All the gears are pressed onto the shafts and are keyed in position. The shafts are of rolled steel, turned to the proper size and finished by grinding. The shafts are heavy and are proportioned to carry their loads safely.

The dipper is made of heavy plate and is equipped with four manganese steel teeth. It is fastened to the handle in such a way that the angle for the cutting edge can be changed. Selected white oak heavily armored with steel plate is employed for the dipper arm. The shipping weight of the shovel is 18½ tons.

Lighting Fires in Cupolas*

BY A. H. STEIN†

Whenever properly constructed burners are used for lighting up the cupola and the few simple details, which consist merely in having a loose layer of coke directly over the sand bottom properly distributed, are observed, a quick and uniform lighting is obtained, especially if dry coke is used for at least the first 12 in. It is immaterial whether the oil burner is applied through the breast opening or through a specially cut hole either underneath the slag hole or at some other convenient place. Naturally the burner flame should strike even with or slightly upward over the sand bottom and in such a way that it passes through the various channels all over the bottom.

Once the coke is ignited so far that dull red spots can be seen through the tuyeres, which takes, according to the conditions and the diameter, from 10 to 20 min., the burner should be stopped, and the natural draft will do the rest. For the start about one-half of the coke bed charge should be placed into the cupola, but always the larger pieces first, usually about the size of a brick. As soon as the red spots appear the regular bed charge should be added with a small quantity of coke left over for leveling up. The opening which has been used for lighting can then be closed, and only the tuyeres which were previously closed (or partly closed) opened until the upper bed is burned suitably to receive the following iron and coke charges. All this time the cupola and surroundings are free from smoke, and what is still more important to the foundryman, a solid uniformly lighted and uniformly settled coke bed is maintained.

As to the cost of lighting, it is found that up to 60 in. inside diameter of cupola, not more than from ¾ to 2 gal. of oil are required; above 60 in. in diameter, in the proportion of about 1 gal. to the foot in diameter. Fuel oil or crude oil selling at from 2 to 4½ cents per gallon, and kerosene from 5 to 9 cents per gallon in barrel lots according to locality, can be used. It becomes evident that the cost of labor besides the cost and storing of wood is far more than lighting with an oil flame.

Oil burners which are used with fuel or crude oil can be operated with compressed air only. These burners have the advantage of instantaneous lighting and that some air can be driven into the cupola with the burner after the oil is turned off, causing a very rapid lighting of the bed charge.

Oil burners used with hand pump attached are to be used with kerosene (coal oil) only. The performance of both type of burners is practically the same, the difference lying in preheating the latter, which takes usually from 2 to 4 min., and that the cupola has to be left to ignite further by natural draft similar to the practice of lighting with wood.

For skin drying or baking molds, for drying and heating ladles, preheating defective castings for "burning on," an oil burner which gives complete combustion is indispensable.

*From a paper read before the American Foundrymen's Association, Buffalo, N. Y.

†Hauck Mfg. Company, Brooklyn, N. Y.

The Foundry & Machine Exhibition Company

The annual meeting of the Foundry & Machine Exhibition Company, which conducts exhibits of foundry appliances in connection with the annual meetings of the foundrymen's national societies, was held in Pittsburgh, October 28. To further promote the educational work of the American Foundrymen's Association and the American Institute of Metals, the company decided to donate to the former organization $500 and to the latter $250. Exhibitors at the recent Buffalo convention were given a rebate of 15 per cent. on the cost of the space they occupied. Officers were elected as follows: F. N. Perkins, Arcade Mfg. Company, Freeport, Ill., president; C. E. Hoyt, Lewis Institute, Chicago, secretary; J. S. McCormick, J. S. McCormick Company, Pittsburgh, treasurer.

The Vauclain Drill, a New Tool*

Design and Tests Comparing the New with the Regular Form of Drill

BY A. C. VAUCLAIN† AND HENRY V. WILLE‡

Speaking generally, there can be no better definition of economical drilling than "rapid drilling"—the saving of time. The fact that a drill will cut at some phenomenal speed or will consume such and such an amount of power means nothing so far as productive capacity is concerned. The object in view is the removal of chips.

Commonly Used Types of Drills

Figs. 1 and 2 illustrate the section scheme of drills now commonly used. While there are many modifications of these, the figures suffice to illustrate their common characteristic, which is that the cutting edges *A* and *B* pass to one side of the axis of motion of the drill instead of through the axis. In this respect there is no difference between Figs. 1 and 2. It will be seen that in this scheme the drill has four distinct edges, *A*, *B*, *C* and *D*, and that the usual name given to it of two-lip drill is not correctly applied.

Referring to Fig. 3, it is customary for the included angle *E* to be of 118 deg. and the cutting edges *C* and *D*, Figs. 1 and 2, therefore have an unfavorable lip angle. These edges constitute what is commonly called the chisel point and their cutting resistance is very great. The cutting edges *A* and *B* cut more freely than the cutting edges *C* and *D* and a tendency to longitudinal fracture of the drill is set up thereby. This is the cause of the splitting of drills.

Description of the Vauclain Drill

The Vauclain drill is a heavy feed drill adapted to the most economical method of metal cutting and of great strength, due to its design. In Fig. 4 is shown a bar comprising two flat bars overlapping and integrally connected as indicated. By beveling, as shown at *O* and *P*, Fig. 5, the edges *A* and *B* are made to meet at the axis of the bar. Since these beveled surfaces are at an angle with the axis the integral connection between the two flat bars remains unbroken. Fig. 6 indicates how the end of the bar would appear when ground to form a drill and Fig. 7 how it would appear if twisted.

Fig. 8-*a* again shows the section or end view of the bar in its original form. Introducing fillets at *R* and *S* gives the form shown in Fig. 8-*b* and removing the corners *W* and *V* modifies it as in Fig. 8-*c*. In Fig. 8-*d*, by adding areas *X* and *Y* to the section, its torsional value is increased. Fig. 9 shows the exact section profile.

Tests have been made for the purpose of comparing the ordinary and the Vauclain types of drills. In order to secure uniform conditions care was taken that the different drill tests should be alike in quality of drill steel, heat treatment and tempering. The material drilled was a tough forging grade steel of about 0.45 per cent. carbon. The table shows the horsepower saved by giving the preference to the feeds, also the relative strength and endurance of the ordinary and the Vauclain types of drills. The size of drill used in all tests was 1 9/64 in.

Comparative Tests of Regular and Vauclain Drills.

Test No.	Kind	Feed per rev.	Speed, r.p.m.	In. per min.	Horsepower expended	Per cent. saving
53	Regular	0.00599	300	1.797	10.86	....
54	Regular	0.02	87	1.74	10.30	....
55	Vauclain	0.02	87	1.74	5.03	51.2
56	Vauclain	0.00599	300	1.797	4.73	56.4

Lackawanna Talbot Furnaces

The Lackawanna Steel Company, Buffalo, N. Y., will add to its steel capacity by the installation of two 100-ton Talbot furnaces. The foundation work is in, and it is expected the furnaces will be completed by April, 1913. They are being built adjoining the Bessemer department and in the most convenient position for duplexing. The ladles of blown metal will be taken by cranes from the Bessemer building through the present cupola house to the Talbot furnaces. The expectation is that 20 to 25 heats will be taken off instead of the larger ones usual in Talbot and other open hearth practice. This will permit of the use of a 1-in. nozzle in pouring, and thus give better assurance of sound ingots.

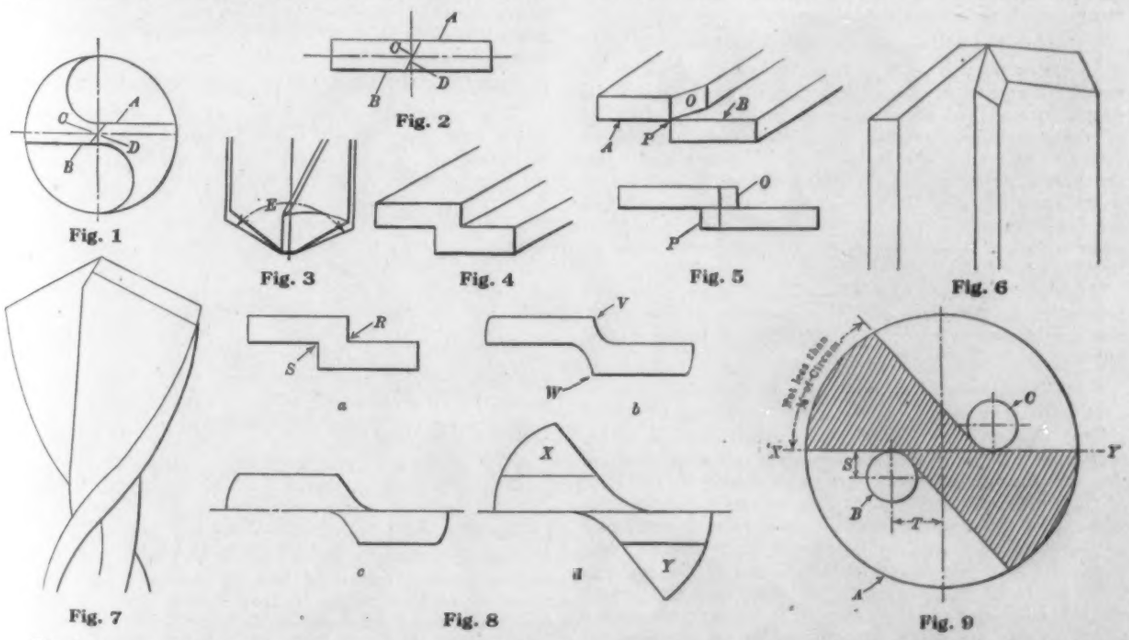


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7 Fig. 8 Fig. 9

Fig. 1—Common Type of Twist Drill. Fig. 2—Common Type of Flat Drill. Fig. 3—Included Angle of Cutting Edges of 118 Deg. Fig. 4—Diagram Illustrating Principle of the Vauclain Drill. Fig. 5—Center Edges of Fig. 4 Shown Beveled. Fig. 6—Showing Fig. 5 Ground to Form a Drill. Fig. 7—Showing Appearance of Drill When Twisted. Fig. 8—Successive Sections Showing Development of Bar of Fig. 4 Into Form Adapted for Vauclain Drill. Fig. 9—Diagram Showing Exact Form of Construction of Drill: A, Circumference of Drill; B and C, 3/16 of Diameter of Drill; S, 3/32 of Diameter of Drill; T, 3/16 of Diameter of Drill; XY Indicates Cutting Edges.

DIAGRAMS SHOWING THE DEVELOPMENT AND CONSTRUCTION OF THE VAUCLAIN METAL DRILL.

The Carnegie Steel Company will erect a new 10-in. finishing mill at its Duquesne works, Duquesne, Pa., on which rounds, flats and squares will be rolled. This will make a total of seven finishing mills at that plant with a combined monthly capacity of 48,000 tons.

*From a paper printed in the Journal for October of the American Society of Mechanical Engineers.

†General superintendent, Southwark Foundry & Machine Company, Philadelphia.

‡Assistant to general superintendent, Baldwin Locomotive Works, Philadelphia, Pa.

Do Employees' Benefit Associations Pay?

Answer of the American Steel Foundries in the Good Will Developed, the Physically Unfit Eliminated and the Benefits Accrued

BY W. H. CAMERON.*

There never was a time in the history of business when the relationship of employer and employee was so much discussed. There is endless talk about wages; working hours and conditions; efficiency; bonuses; profit sharing plans; insurance and pensions. These discussions are stimulating a deeper interest in the life and welfare of the workman, and aside from the final adjustment of the ethics of the question, we may take it for granted that every employer will be willing to increase his efforts and expense if in the end he can be sure of a greater degree of co-operation and good will from his workmen.

There is a tendency to place the burden of care of the employee upon the shoulders of the employer. This is illustrated by the enactment of workmen's compensation laws, which provide, on a liberal scale, for the accident risks during working hours. The State says that the hazard of the work shall be charged to the industry, but it has not yet assumed the position of the British and European governments of caring for the workmen of small means disabled through sickness or accident while off duty, nor has provision been made for the care of the family when death occurs. If insurance against the inevitable hazards of life is the cure-all for the woes of the average workman—and Lloyds will insure against twins—why should not an employer make an effort to secure the undivided attention and good will of his employee by means of cheap comprehensive insurance?

Inadequacy of Insurance of Those So Protected

A statement was recently made by an official of an insurance company in New York that 95 per cent. of the people insured had no other assets or estate at the time of death. A large percentage of workmen depend on fraternal and other cheap forms of insurance, and while the protection given by these associations is helpful in many cases the workman seldom protects himself and his family to the extent that he should, and in a great many instances the insurance is not comprehensive enough to take care of all of the contingencies in his life.

If, then, insurance protection, furnished on a scale in proportion to the income of the workman, is the workman's only asset, can a plan be worked out to the mutual interests of both employer and employee?

The General Plan of the Benefit Association

A year or more ago the American Steel Foundries considered this question, and decided to organize, as a department of its business, an Employees' Benefit Association. The plan decided upon was protection to the limit of the workman's ability to pay, as well as to provide him with a sufficient sum of money to support himself and family when sick, and to provide a death benefit commensurate with his annual earnings, and at the scale in which his family was accustomed to live. It is well known that workmen earning from $600 to $1,000 per year cannot afford to pay for much insurance, and an investigation disclosed the fact that in many instances the average workman protected himself and family in case of death only, and then for small sums and specific purposes. The plan decided upon was to provide half wages for a year, if need be, in case of illness or accident happening while on duty; one year's wages for death due to sickness and two years' wages for death caused by accident while off duty; as well as partial and complete disability benefits on a similar scale.

Age of the Employees and Insurance Assessment

As a preliminary to determining the cost of this protection an examination was made of over 2000 of the company's workmen in both eastern and western districts. This examination revealed the average age of the workmen in four plants to be 30 to 31 years at each plant; also that more than half the employees were under 30 years of age; that only 5 per cent. of the workmen were over 50 years of age, and based on the statistics of this unique body of men, a lower assessment than that charged by any other insurance company, or fraternal society, would be sufficient to pay the sick and death benefits, if the expenses of the association were not included in the cost.

The rate of contribution was then fixed at 1½ per cent. of the wages earned, with a limit of $2,000 liability. To fix the monthly assessment rate, so that the members would know in advance the exact sum of money to be paid each month, a classification was arranged, based on average monthly earnings, e.g., a workman earning $2 per day would enter class No. 7, and pay 75 cents per month. This class plan avoids dispute as to the amount of disability or death benefits payable when the earnings fluctuate. Therefore, a member in class No. 7 would be entitled to $1 benefit for each working day for a year (but not including the first seven days) and his family would be paid $600 if he should die from sickness, and $1,200 if death was caused by an accident while off duty. Assessments stop when disability commences, and this rule applies to disablements from accidents while the member is on duty, although the company and not the association pays a similar scale of benefits for accidents which happen while the member is at work. A full year's wages are also paid for the loss of a hand or foot; two years' wages for the loss of two hands or two feet; half a year's wages for the loss of an eye and two years' wages for the loss of two eyes.

Controlled by Workmen but Company Pays Administration

It was realized at the beginning that the association would only be successful if the members themselves were in control of its affairs and destiny, and the plan, therefore, included the control of the association by a board of two trustees from each plant. Even the appointment of the manager of the association was placed within the jurisdiction of the trustees. The company's contribution towards the welfare of the association was the guaranty of the integrity of the funds; temporary advances for deficits and the contribution of all the expense of management, as well as the assistance of its accounting department in collecting the contributions from the wages of its members. Rules and regulations were formulated to guard the interests of all of the members, and after full consideration the trustees approved and accepted them.

Within three months after the association was organized 95 per cent. of the total organization of the company became members, from the president to the humblest worker—and the results of the first year's experience has proved that the basis of the assessment was sufficient to pay the association's debts with a sufficient margin for contingencies. Only once has the company been called upon to advance money to pay benefits, and that was within the first two weeks of the association's career.

How the Plan Has Worked

Four hundred and seventeen cases of disability and 16 deaths have occurred within the year; and $25,000 has been distributed in the payment of benefits. The average death benefit has amounted to $840. Not one death has occurred among the company's employees since the association commenced business which has not been taken care of through the association's funds. Together with the compensation paid by the company for accidents happening while on duty, this means that every sick or injured member absent from duty over 7 days has received half wages, and the families of the deceased members have received a year's wages or more.

It is interesting to note that 12 of the 16 deceased members were married men and left 12 widows and 45 children who were taken care of. Only two of these sixteen members were carrying other insurance, and only one member left property of any account.

*Manager Casualty Department, American Steel Foundries.

All old employees were given the privilege of membership without medical examination and irrespective of age, but since the association has been organized all of the new employees desirous of becoming members have been medically examined.

The Opportunity of Physical Examination of Employees

We are, therefore, now in a position to ask ourselves the question, "Has the association paid from an employer's standpoint?" The opportunity to examine all applicants for employment is probably the chief direct benefit the company derives from the expense and trouble involved in supervising the association's affairs. The responsibilities laid upon the employer under the workmen's compensation acts compel him to guard against accidents due to physical deficiencies such as rupture, weak heart, tuberculosis, epilepsy, venereal and other diseases, which may contribute to a subsequent casualty or incapacitate a workman from a physical standpoint to do a full day's work. At the works of the American Steel Foundries employing the largest number of men the average rejections by the medical examiner since the association was organized has been 15 per cent.

The elimination of men who are unable to meet the physical standard adopted has unquestionably cut down the accident record, and, of course, the cost of accidents. When it is remembered that under the employers' liability and workmen's compensation laws the employer is liable for every accident not wilfully or intentionally caused by the workman, it is important not to assume the risk of employing men with physical defects who may at any time collapse while at work and attribute the cause to an accident. There is a record of such a case at one of the plants. A lamp trimmer was found dead near an electric lamp he had been trimming and the outward evidences of accident were so slight that it is not known whether the cause of death was heart failure or electrocution.

Obtaining Co-operation from Workmen

Good will is another advantage which makes it pay from the employer's standpoint to organize his employees in a benefit association. While good will can never be measured in dollars and cents and is a composite of all the elements involved in working conditions and personal relationships, still there is no doubt whatever that when an employee realizes that his employer is interested in his personal welfare and is willing to give him an opportunity to contribute toward his own protection at cost, he will undoubtedly feel grateful and loyal and he will reflect this attitude in his work.

In this age of large industries, when personal contact between employer and employee is impossible, it becomes important for the employer to find a means of expressing his good will toward his employee and in a way that will not be considered offensive, as there is nothing the employee despises so much as charity.

It may be the duty of the State or Federal government to pass laws similar to the recently enacted English insurance laws, but until this is done it is believed an employees' benefit association, well managed and offering complete protection at the lowest possible cost, is a good substitute and a ready means of bringing the employer and employee closer together.

To Buy Motors for Costa Rican Boats

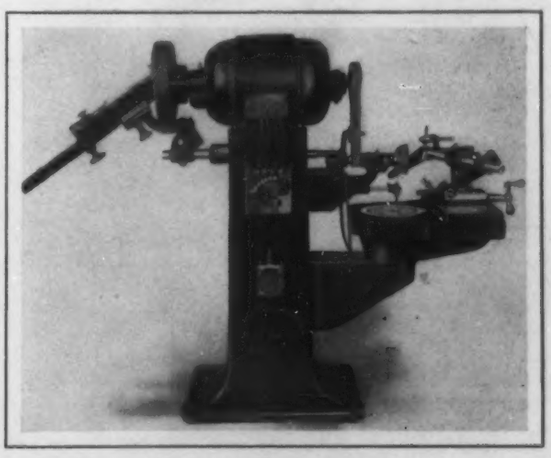
H. T. Purdy, head of the Purdy Engineering Company, San Jose, Costa Rica, arrived in New York October 30, for a stay of about six weeks. Mr. Purdy's company, through its affiliation with Wonham, Sanger & Bates, 30 Church street, New York, represents a number of American manufacturers and specializes in mining machinery, tramways and hydraulic apparatus, and has been a leading factor in introducing American machinery in Central America. Mr. Purdy is also the administrator of the West Coast Transportation Line, which operates nine shallow-draft steamboats, ranging from 30 to 60 ft. in length, in Costa Rica. Gasoline motors are to be substituted for steam engines in the boats, and to obtain the necessary equipment while in this country is a part of Mr. Purdy's plans. The boats carry both freight and passengers.

Speaking of business conditions in Costa Rica, Mr. Purdy said that trade had been steady but not "rushing." He reiterated the statement often made that Germany and England are no mean competitors, the former in machinery especially, and he declared the United States manufacturers have much to learn still as to how to do business with Central America. One hint Mr. Purdy gave was that consular or translation charges should never be put on a bill, for, while the practice may be honest, it makes anything but a good impression on the Spanish-speaking natives, who always infer that the American house with which they are doing business has employees familiar with Spanish. In the case of the consular charges, they have been abolished by Costa Rica. If translators must be employed, no extra charge for them should be specified, said Mr. Purdy, who added that it is a mistake never made by Germany or England. He said, also, that there seems to be a general misunderstanding as to postal rates to Costa Rica, firms in the latter country being annoyed by the many letters received bearing a two-cent stamp instead of the required five-cent stamp. The present rainy season in Costa Rica, he said, has been so far the driest in 10 years of the 14 he has been in that country. His company also has an office in Managua, Nicaragua.

Cutter, Reamer and Drill Grinding Machine

A new motor-driven combination cutter, reamer and drill-grinding machine has been brought out by the Wilmarth & Morman Company, Grand Rapids, Mich. In general construction the machine resembles the BX New Yankee grinding machine of this company, which was illustrated in *The Iron Age*, July 4, 1912, but the capacity of this new machine is not so great.

This machine will grind face and side milling cutters up to 12 in. in diameter, angular milling cutters of any angle up to 8 in., and plain milling cutters of any type



A Motor-Driven Combination Cutter, Reamer and Drill Grinding Machine Built by the Wilmarth & Morman Company, Grand Rapids, Mich.

up to the same figure. Straight or taper reamers having a maximum length of 17 in. with flutes not exceeding 11½ in. can be ground, together with taps where the flutes do not exceed this figure in length. Other cutters accommodated include gear and forming cutters of any length up to 5½ in. in diameter and hobs of the same dimensions. The machine will take cylindrical work which is to be ground either straight or taper up to a maximum diameter of 7¼ in. and a length of 11½ in. The distance between centers is 17 in., and holes can be ground in internal work up to a maximum depth of 4 in. ,and a diameter of 10½ in.

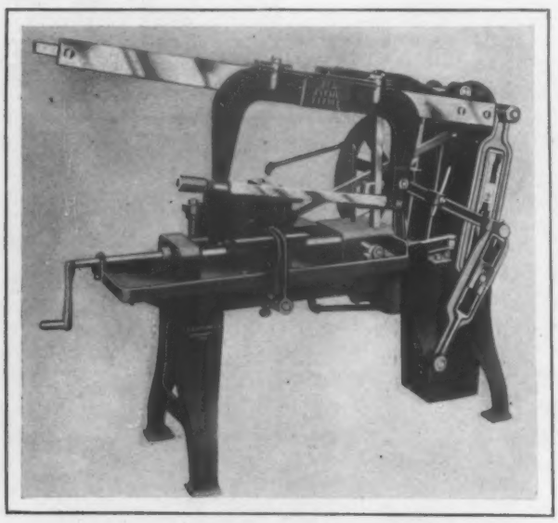
The drill-grinding attachment supplied with this machine is of the builder's regular New Yankee non-caliper-ing type. In using the machine for grinding drills it is simply necessary to drop the drill into the holder and grind. The capacity of this attachment ranges from a No. 60 to a ⅝-in. drill, from 3/32 to 1¼ in., or from ⅛ to 2¼ in., as may be desired. The motor employed for driving this machine has a capacity of 1 hp. and was specially designed by the General Electric Company for this machine.

Improved High-Speed Hack Saw Machine

The use of an improved raising device is the special feature characterizing the new No. 7 Kuik Kut high-speed hack saw machine that has been recently developed by E. C. Atkins & Co., Indianapolis, Ind. Other improvements include the addition of a lubricating system with a pump, tank, bed pan and pipes as shown in the accompanying engraving. In addition to these special features the machine possesses the swivel vise and the automatic adjustment for the length of stroke, both of which were found in the company's other machines, one of which was illustrated in *The Iron Age*, September 26, 1911.

The raising device which lifts the blade on the non-cutting stroke keeps it from dragging in the kerf and thus prevents dulling of the teeth. It consists of a friction grip working on a heavy upright bar adjusted by a counterbalancing weight. To enable the machine to be used for cutting large sizes of iron and soft steel and also small sizes of this material and hard tool steel, a two-speed driving pulley is employed. This gives a difference of 30 strokes per minute. The minimum speed used on tool steel and small sizes of stock is 50 strokes, which with an average travel of 15 in. per stroke gives a blade travel of 750 in. per minute. The maximum speed used on large sizes of iron and soft steel is 80 strokes per minute, which gives a blade travel of 100 ft. per minute.

In this new type of machine provision has been made for a direct-connected electric motor drive. Where the machine is to be used on a direct-current circuit a standard motor operating at from 550 to 1100 r.p.m. is used. This



The Improved No. 7 Kwik Kut High Speed Hack Saw Machine Built by E. C. Atkins & Co., Indianapolis, Ind.

motor rests on a special bracket and is connected by a silent chain running over hardened tool steel gears. The speed is controlled by a regulator attached to the motor bracket, which enables the operator to vary the speed above 50 strokes per minute by small increments. On alternating-current circuits a back-geared motor with a cone pulley connected by belt with the cone pulley on the machine is used instead of the direct chain drive. The length of the stroke is automatically determined by the size of the material held in the vise. The two-speed pulley enables an equal blade travel to be maintained for various sizes of stock to a certain extent, but the speed can be controlled very accurately by the regulating device provided.

The Perry Iron Company, Erie, Pa., recently purchased by Pickands, Mather & Co., Cleveland, Ohio, has been reorganized by the election of H. G. Dalton, president; George H. Beaumont, vice-president; M. L. Mozier, secretary, and E. P. Williams, treasurer. The name of the company will not be changed. Mr. Mozier resides in Erie and was secretary and treasurer of the old company. The other new officers are associated with Pickands, Mather & Co. in Cleveland. The company operates the Perry blast furnace.

Spring Lock Washer for Bolts

For use on bolts in a great variety of machinery, the Harvey Spring Lock Washer Company, Ltd., London, which is represented in this country by Louis A. Freedman, 135 West Eighty-sixth street, New York City, has developed the Lamrig washer. Among the places where this washer can be used are railroad rolling stock and tracks, mining, textile, printing and agricultural machinery, internal combustion engines and many others. Some of the special advantages claimed for it are the firm clamping of the nut or screw set, the elimination of side strain on the bolts, easy application and ability to be used a number of times.

An Improved Type of Spring Lock Nut Washer for Use on Railroad Rolling Stock and Rails

As will be noticed from the accompanying engraving, the washer consists of a ring with two segments, which almost entirely surround the ring, the ends being bent out of the plane of the ring to provide for the locking. Several sizes of washer for bolts ranging from ¼ to 1¼ in. in diameter are made.

Revised Figures for Copper, Lead and Zinc

The following revised statistics of production have been issued by the United States Geological Survey:

The smelter production of copper in the United States in 1911 was 1,097,232,749 lb., or 56 per cent. of the world's production. The production surpassed that of 1910 by 8,995,317 lb. The production of refined lead in 1911 shows an output of 486,976 net tons, which is 16,596 tons ahead of the best preceding record—that of 1910. Missouri was the largest producer, furnishing nearly 45 per cent. of the domestic pig lead. The production of primary spelter (zinc) from domestic ore in 1911 was 271,621 net tons, valued at $30,964,794. This is the greatest production in the history of the industry and shows an increase of 19,142 tons over 1910.

The Compressed Air Machinery Company, 531 Market Street, San Francisco, Cal., has changed its name to Compressed Air & General Machinery Company, as being better suited to its business. The company has a manufacturing department and a supply department. It manufactures mining machinery, such as air compressors, hoists and rock drills, and does a general manufacturing and repair business. In its supply department it handles boilers and steam engines, gas engines, wood split pulleys, all kinds of belting, valves, pipe and fittings, etc. No change has been made in the ownership of the corporation. No new plant is contemplated, as the company moved into its present quarters only five years ago. P. H. Reardon is president; Eldridge Green, vice-president; Allan L. Green, secretary, and Charles Arthur Green, assistant secretary and treasurer.

Tests of wrought-iron plate girders about 22 ft. long and 30 in. deep were reported in the Engineering Record of August 24 by Prof. Frank P. McKibben, Lehigh University. Besides the size of the specimens tested, interest lies in the fact that the girders were taken from a bridge after 28 years' use. The girders were investigated in a large machine, subjecting them to transverse stresses. Each girder was mounted on roller bearings and the load applied at two intermediate points. One girder failed by lateral buckling of the compression flange, and the other by a tension fracture on the bottom flange. The elastic limit was reached apparently at a point equivalent to about 59 per cent. of the maximum load in each case, and appeared to correspond to about 18,000 lb. per sq. in. unit stress.

The Alexander Milburn Company, acetylene apparatus, has removed to its new premises, 1420-22-24-26 West Baltimore street, Baltimore, Md.

Increased Safety in the Use of Lathe Dogs

A recent contribution to the number of safety appliances for use in the machine shop is a new type of lathe dog that has been brought out by J. H. Williams & Co.,

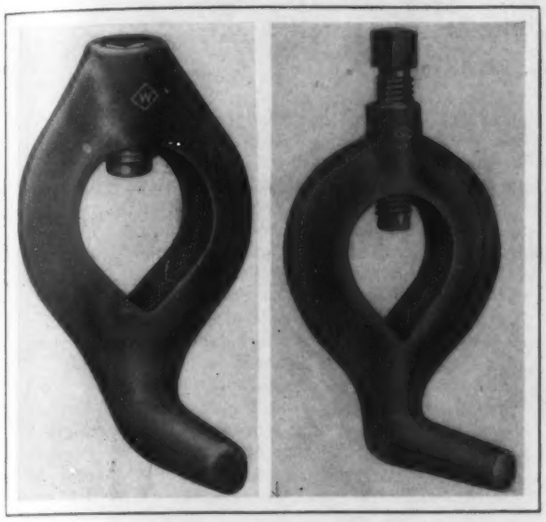


Fig. 1—New Style Fig. 2—Old Style
View Showing the New and the Old Types of Lathe Dogs Made by J. H. Williams & Co., Brooklyn, N. Y.

Brooklyn, N. Y. The changes made in the design to produce this new dog are noteworthy and can be easily seen from an inspection of the accompanying engravings. Fig. 1 is a view of the Vulcan safety lathe dog, as the new style is known, while the older type of bent tail dog is shown in Fig. 2.

The principal changes in construction of the dog are the use of a safety screw having a square opening and the filling up of the space between the body of the dog and the screw hub. In this way the projecting head screw which is apt to catch in the clothing of the machinist has been eliminated. Another feature about the new dog, while perhaps not as important as those described, is the increasing of the diameter of the screw. This change, it is emphasized, has also resulted in the production of a tool having a better balance when in the lathe. Another feature about the increased diameter of the screw is that the old style square head and the safety screws are not interchangeable, which prevents the machinist from using the dangerous projecting square head screw in the new dog. The new construction will undoubtedly commend itself to both employers and workmen.

The Italian Scrap Iron Market

Consul General James A. Smith, Genoa, reports to the Bureau of Foreign and Domestic Commerce as follows:

There is an extensive market for scrap in Italy, but the share which the United States has in this trade is comparatively small, due largely, it is believed, to higher prices than those quoted by exporters of other countries. The Italian imports of scrap iron and steel for the past three years were as follows, in metric tons of 2204.6 lb.:

Countries	1909	1910	1911
United States	9,190.2	9,691.0	12,658.8
Austria-Hungary	4,166.7	10,088.0	12,955.1
Belgium	32,620.4	15,832.5	29,002.1
France	70,210.5	79,314.6	56,781.3
Germany	85,037.7	69,344.7	67,039.1
Great Britain	83,909.6	42,966.3	36,929.0
Spain	6,076.6	8,391.0	7,707.6
Switzerland	30,273.6	32,183.7	37,645.2
Turkey in Europe	4,837.0	19,523.3	7,146.6
British India	21,440.0	22,155.0	25,128.6
Egypt	9,221.5	15,070.9	6,007.0
Other countries	59,369.7	62,043.1	93,702.7
Total	416,353.5	386,604.1	392,703.1

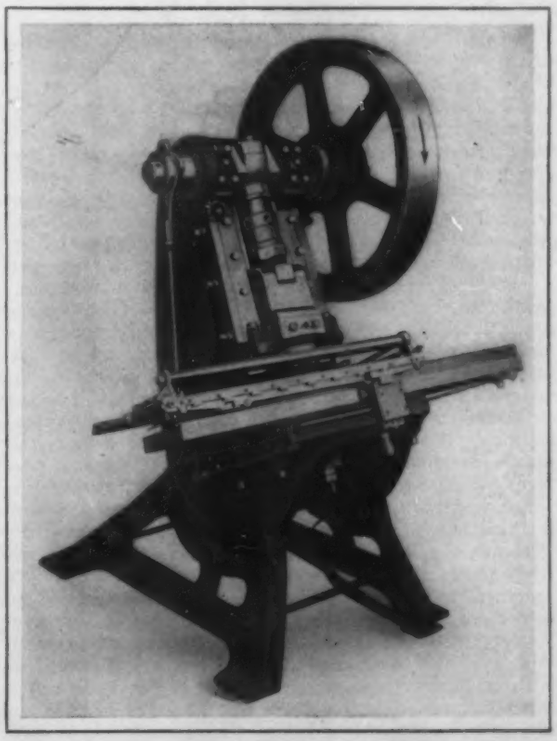
The value of these imports was $6,063,336 in 1911, $5,969,167 in 1910, and $7,232,060 in 1909. Scrap iron and steel are subjected in Italy to an import duty of 1 lira (19.3c.) per metric quintal (220.46 lb.), minus the amount of the export tax paid in the country of origin, if one was paid.

Stagger Feed Spacing Table for Presses

For rapidly and accurately feeding decorated stock for bottle caps, covers, etc., to its inclinable and double-action presses, the E. W. Bliss Company, 11 Adams street, Brooklyn, N. Y., has designed a stagger feed spacing table. The table is designed to handle standard sheets 20 in. wide by 28 in. long, and if desired can be adjusted to take sheets up to a maximum length of 30 in. The speed may be from 120 to 150 strokes per minute according to the size and character of the work being handled.

The table is moved by the operator after each stroke of the press and a cam-actuated stop which engages a rack on the table locks it in position. The table is a light aluminum casting mounted on rollers, a type of construction that permits the operator to cut an entire row of blanks without stopping the press. A handle bar is provided to move the table and also to control the grippers through eccentric pivots. A pair of scrap cutting dies is employed to trim the sheets so that new gauge points are made as each row is cut. The spacing rack for gauging the cut edges is clamped over a T-slot and can be readily removed and others attached, a separate rack being required for each different size of cut edge. The scrap is cut into small pieces and the cutters are usually mounted on the same block as the die to facilitate setting.

In operation the sheet is first placed between the guides on the table and is allowed to rest on a pair of preliminary



A Patented Stagger Feed Spacing Table for Inclinable and Double Action Presses Built by the E. W. Bliss Company, Brooklyn, N. Y.

stops which place it in position for cutting the first row. The grippers are closed by a twist of the handle bar, the preliminary stops are lifted clear by the knob at the right and the first row is cut. The sheet is then allowed to drop against a straight edge at the back, which serves as a gauge for the subsequent rows. All the operator has to do is to open the grippers, permit the sheet to fall and close the grippers again.

A steel hoop plant to cost $750,000 is to be established at once at Alton, Ill., by a syndicate including T. S. Clark, Erie, Pa.; John R. Hastings, Lima, Ohio; E. J. Anglin, Pittsburgh, Pa., and George Schauwecker, Sharon, Pa. The negotiations with the syndicate were carried on by the Alton Board of Trade. An option has been taken on a site for the plant, which is expected to employ about 600 men and to have a monthly payroll of about $30,000.

A Story of a Visit to Sir Henry Bessemer*

Impressions of a Leading American Exponent of the Basic Open-Hearth Process—Bessemer and the Mushet Patent

BY S. T. WELLMAN, CLEVELAND

About 20 years ago, while crossing the Atlantic, I happened to be on the same ship with Andrew Carnegie. Shortly before landing he asked me if I would not like to meet Sir Henry Bessemer. I answered that nothing would please me better. "Well," he said, "within a few days after we reach London I will try to arrange for it," which he did by making an appointment with Sir Henry to come out to his residence at Denmark Hill in the suburbs of London. So one morning we drove out there and spent several hours with him.

Sir Henry Bessemer was a tall, fine looking man, a typical Englishman and a good talker, who liked nothing better than to talk about the early history of the steel business. He first took us around the grounds, which were very large, containing 30 to 40 acres. I cannot better describe the place than by copying the following from a London paper. The house stands on high ground, looking toward the Crystal Palace.

Bessemer's Home

"From the terrace of Sir Henry Bessemer's house the distant view is singularly pleasing and essentially English in its unhidden sylvan character. The foreground of the picture is almost entirely manufactured. Its natural slope toward the valley is perhaps generally maintained, but hills have grown where there were depressions, rocks have sprouted forth where there was nothing but gravel, and a lake with its feeder and outlet forms part of the purely artificial river system. Beyond the superbly terraced lawns is a sweet bit of real nature, a meadow, in which the tall rye grass, buttercups and ox-eyed daisies wave at every puff of wind, making the rich carpet red, yellow and white by turns. At the lower side of this flat meadow is a bowling green, level as a billiard table, and separated from it by a rim of ground ivy, next to which comes a triumph of landscape gardening—a great clump of rhododendrons on the rocky shore of the picturesque lake—'Nowhere,' Sir Henry Bessemer tells his guests, 'more than 18 in. deep, an excellent depth for summer boating and winter skating, and most convenient if a child falls out of the boat or the ice gives way.' Around the lake are thick shrubberies, in which hawthorn, jasmine and honeysuckle contend with the lilac, laburnum, laurel and innumerable rhododendrons. Presently the host vanished in a bush, as if by pantomimic trick, and in a moment reappeared and led the way into a cavern filled with a magnificent collection of ferns, heated to the precise temperature, and lighted by a skillful combination of toplights and mirrors. At one extremity of this cave, lined with rocks made of brick and cement, is a waterfall pouring over a glass wall; at the other a snug little smoking room, looking over the lake, with all necessary refreshments hidden behind a rock, apparently as massive as a cheese ring, and of nearly the same outline."

The walls of these rooms, as well as the hill itself, were built of a great variety of stone. Sir Henry told us with a great deal of glee of the visit, not long before, of a celebrated geologist, who, when shown the caves and rooms, was delighted to see such a collection of rocks and was able to tell his host exactly what part of the world many of them came from, but was very much nonplused and could hardly believe him when Sir Henry told him that they were all artificial.

After wandering around the beautiful grounds as long as we wished, we were invited into the library and were entertained for two or three hours by Mr. Bessemer with his history of his early experience in the manufacture of steel.

Early Experiments

He explained that the reason he was first induced to think of an experiment with a new process of iron making was the knowledge which came to him that the French Emperor, Louis Napoleon, was seeking a material to make better artillery than was then in use. Bessemer's first idea was that he could make an improved wrought iron by blowing air through the liquid iron instead of stirring it with a rabble to bring it in contact with metallic oxides, as was the practice in the puddling furnace. To carry out this idea, he constructed a small stationary converter of fire brick. This was about 3 ft. inside diameter and considerably more in hight. The pipes or tuyeres entered at the side not much above the bottom. They were all connected with the blast box which encircled the converter—a pipe leading from this to the blowing engine.

The converter was covered and a hole in the side near the top was left as an outlet for the flame. When it was finished he sent to the iron store for "a ton of pig iron"—no other specification. Any old thing would do, so long as it was pig iron. Here was Bessemer's lucky day. He knew nothing at that time about the chemistry of iron or what composition was necessary in the iron to make good steel. So it was pure chance that it so happened that the iron sent to fill his order was the only brand, "Blaenavon," made in all Great Britain at that time that would have made good malleable steel under the conditions by which it was made. It was low in phosphorus and sulphur, high in silicon and contained a little manganese. So the first trial was successful in making a metal which, when tried in a neighboring iron works, rolled and hammered successfully. The bars were treated in many ways, both hot and cold, and proved to be so strong and tough that it created a great deal of interest in all who saw it.

Mr. Bessemer said that if the steel had been made from any other brand of iron made in Great Britain, the result would surely have been such a worthless metal, brittle and rotten at all temperatures, that he would have abandoned the experiment at once. Surely it was a lucky chance that sent him to that iron dealer.

First Licenses Sold

Bessemer immediately took out patents on the process and as the British Society met soon after at Cheltenham (this was in 1856), he prepared a paper on the new process, which was read, and exhibited his samples. The paper created a great deal of excitement among the iron makers present, so much so that before the meeting closed he sold shop rights to the five leading iron works of England for the sum of £10,000 each, and went back to his home with the cash. As I have said before, very little was known of the chemistry of iron and absolutely nothing of steel.

As soon as possible all of the licensees of the new process built converters at their own works and tried to make steel from their own iron, but every one of the experiments was a dismal failure, and not a pound of malleable steel could be made. It was, of course, a great surprise to every one, including Mr. Bessemer. He was branded as a trickster and thief, and every effort was made to get the money back, but he was not the kind of man to deceive. He knew that there must be a reason why one kind of pig iron would make good steel and another brand would not, and he determined to find out the reason, but it would take time and money to do it. Luckily he now had both, so he went to work. He found a chemist who thought he could work out a method for finding the composition of the various samples. He succeeded in demonstrating that the good steel was low in phosphorus and sulphur, while the bad was very high in both these elements.

The First Bessemer Iron

Mr. Bessemer kept all this knowledge to himself, and went quietly to work to build a small converting plant with which to experiment and to demonstrate the process. Meanwhile, he went to work with the help of some friends

*From the journal of the Cleveland Engineering Society, Cleveland, Ohio.

to buy back the shop rights which he had sold, as he had formed very much higher ideas as to the value of his process than at first. This he succeeded in doing, paying for one right £10,000 and for another £20,000, or twice as much as he had received. When his experimental plant was ready he made a journey to the West Cumberland district to arrange for some iron. The ores from which the first iron he had used was made had come from there, and he had discovered that it and the West Cumberland ores were low in phosphorus, so he ordered some iron made from that ore. It was duly received at the works and the first steel in the new plant was made, but very much to his surprise it was no better than that made by his licensees. Then he had the iron analyzed and found it high in phosphorus. He could not understand how this could happen when the ore was so free from this bad element, so he journeyed back to the West Cumberland furnace to find the trouble if possible.

In walking around the plant with the manager he came across a large pile of black looking rock or other mineral and asked what it was. The manager told him that it was the flux he used. Well, what was it? Why, it was puddle furnace cinder; this he knew must contain a large percentage of phosphorus; he had found the cause of the trouble sure enough. "Why do you use it?" he asked. "Why, to make the furnace work smooth and the iron fluid." The result of the visit was an order for more iron to be made from straight ore with no puddle cinder. The order was filled and was billed as "Bessemer iron"—a trade name which it bears to this day.

No Licenses but Royalties

The next experiment was successful and the steel turned out was all right in every respect and fully as good as the first trial, the samples from which were shown at Cheltenham. It was now comparatively smooth sailing for the new works and he was soon able to demonstrate that he could make uniformly good steel that was strong and tough, hot or cold; also steel of any carbonization desired, hard or soft. His old friends, from whom he had bought back the licenses, then came and demanded them back, but he said, no; the process was much more valuable than he at first supposed and he had decided not to sell any shop rights, but would license any one to use the process for a royalty of £1 per ton for rails and £2 for all other work. This royalty he insisted on and it was paid by all users of the process in England during the life of the patent.

The process very soon came into general use, as the trade was ripe for it. It was just what was wanted, particularly for rails. The old wrought iron rails were very poor and the "Bessemer steel rail" filled a long felt want; without it the great railroads of the world would be almost impossible. The first rail was laid at the Crewe Station of the London & Northwestern Railroad and wore out 23 iron rails.

Mushet's Manganese Patent and Its Lapse

Bessemer soon found that manganese was necessary in the iron to make the steel malleable when hot in rolling or hammering, but the process of adding a carbide of manganese to this mixture was the idea of another inventor, Robert Mushet, who thus became a rival of Bessemer, and as Mushet sold an interest in the patent to one of the iron companies who were trying to get back the shop right which they had sold back to Bessemer, they used this as a lever to demand a very large royalty from Bessemer for the use of the manganese patent. Through this a great deal of bad feeling was worked up between Bessemer and Mushet. The handling and caring for Mushet's patent was left by him to one of his partners, and he, by some oversight or negligence, allowed the patent to lapse by a failure to pay the annual fees when due; so, very much to Bessemer's surprise and joy, he learned one morning that this had happened, and that Mushet's patent was public property; that he as well as all others was free to use it. Bessemer's process was useless without Mushet's invention, and Mushet ought to have made a fortune out of it, but he made nothing and died a poor man.

Several years after the lapsing of Mushet's patent, one evening there was a knock at Mr. Bessemer's door. On opening it the servant found a young woman, poorly dressed, who asked to see Mr. Bessemer. She was shown into the library and introduced herself to Mr. Bessemer as the daughter of Mr. Mushet. She said she had heard that he was a kind-hearted man. She had come of her own free will to tell him that her father and his family were very poor and suffering for the necessities of life. She knew that by the aid of her father's invention he was being helped to make a great deal of money and she thought that perhaps he would help them in their great need. The result of this appeal was that Mr. Bessemer during the remainder of Mr. Mushet's life paid him a pension of £300 per year, thus proving the truth of what the daughter had heard. It certainly was a noble act.

Changes in the Converter

Bessemer's model works soon became the mecca of the iron men of England, for here were worked out all the early problems of Bessemer steel making. The stationary converter was soon abandoned for the tipping converter, mounted on trunnions, with a removable bottom, in which were placed the fire clay tuyeres. Except in some minor details this beautifully simple piece of apparatus has remained unchanged for 50 years. The works in Sheffield still is in operation under the name of Henry Bessemer & Company. He made a large fortune from the royalties acquired in England, but comparatively little from the rest of the world.

For many years, more steel was produced by the Bessemer process than by all others put together, but now the basic open-hearth has passed it in tonnage, and it would seem that the day is not far distant when, as A. L. Holley used to predict, the open-hearth will go to the funeral of the Bessemer process. The reason for this is not hard to see. The acid Bessemer process must have pig iron low in phosphorus and sulphur, high in silicon, within very close limits; the basic Bessemer must have high phosphorus, low sulphur and silicon. The particular kind of ores necessary to make these kinds of iron are getting scarcer every year.

While for the basic open-hearth only low silicon is essential, phosphorus and sulphur can be removed by the process and much lower phosphorus and sulphur be left in the finished steel than is found in the average Bessemer.

In several works in this country a process is in use in which high silicon pig iron, also high in phosphorus, is used. Most of the silicon and carbon are blown out in the Bessemer converter, the metal being then removed to an open-hearth furnace, where the phosphorus and sulphur and the remainder of the carbon are removed and the steel finished.

Bessemer's Royalties His Versatility

Bessemer was a very versatile inventor, but the bulk of his fortune was made from his steel process. The patent for this expired in 1870. During its life he received in royalties over £1,000,000. Very seldom has an inventor been so well rewarded.

One invention of his was "Bessemer gold powder," the method of manufacture of which he did not patent, but kept a secret. Only four or five workmen were employed, as the machinery was automatic. After he had made his fortune from steel, he gave the gold powder business outright to the two leading workmen who had grown old in his employ.

He was the inventor of several patents on sugar mill machinery, also of a system of furnaces using combustion under very high pressure. He spent a great deal of money on this but nothing came of it.

He only left England on one occasion, when he crossed the Channel to France. He was so terribly sick that he came near dying, but this set him to working on an idea for a steady cabin steamer. Thousands of pounds were spent in building a very large boat embodying his idea, but it was a failure and was broken up. If this had been a success he said he would have visited America; but much as he desired to come, he did not dare to take the risk.

He was always busy at something new. At the time of our visit he was working on a solar furnace, using a large number of 24-in. lenses. The rays of the sun coming through were concentrated in a small furnace, resulting in a tremendous temperature. I never heard the result of this experiment.

I bade good-bye to our host with regret and shall never forget the visit. I saw him but once again, just for a few moments, in London.

American Institute of Mining Engineers

An Unusual Collection of Papers on Iron and Steel Metallurgy Presented at the Cleveland Meeting

The Iron and Steel Committee of the American Institute of Mining Engineers was signally successful in its efforts to give distinction to the Cleveland meeting of October 28-31 by the number and character of the papers presented. Probably no equal showing in literature on iron and steel has been made at any meeting of the institute, perhaps excepting the rare occasions on which it has joined forces with the Iron and Steel Institute in an international gathering. In line with the history of the American Institute of Mining Engineers, particularly the records of some of its meetings in the eighteen-eighties, the blast furnace and the materials of the blast furnace had a large place in the discussions at Cleveland. However, foundry metallurgy was not overlooked, and there were several noteworthy papers on steel, especially on case hardening. A feature of the meeting was the presentation of the draft of a new constitution and by-laws by the committee appointed to prepare a plan for the future government of the institute.

New System of Rail Inspection

Briefly, reference was made in *The Iron Age* of October 31 to the excellent papers presented at the two sessions of Tuesday. Robert W. Hunt, Chicago, in his paper on "Recent Developments in the Inspection of Steel Rails," referred to the situation as it existed early this year when the chief executives of several of the principal railroad systems of the country decided to work for better results under the present specifications and to secure accurate data on the causes of rail failures. They arranged to try a more thorough system of inspection by placing inspectors in each manufacturing department of the rail plants to be on duty during all working hours. Instructions to the inspectors were to observe carefully all the manufacturing operations, and if they saw any serious variation from the details of the specifications under which the rails were contracted to be made, or from the recognized good practice of the plant, they were at once to call the attention of the foreman to what was happening, make a record of the fact and also report it to the inspector in the succeeding department to which the ingot, bloom or rail would pass in the progress of its making. The particulars of the inspector's observations were to be reported in writing to the proper office of the purchaser and in any case of neglect of duty or bad work the fact was to be given in writing to the official in charge of the work, thereby affording an opportunity for immediate investigation and so be a check on the judgment and fairness of the inspector making the report.

The expectation was that this new plan of inspection would insure extra care on the part of the inspectors in observing the behavior of the metal in the rolls and at the drop test, and a careful examination of the finished rail. It also insured the correct marking of heat numbers and locations of rails in the ingots from which they were rolled. It was expected, too, that the effect on the workmen of knowing that their responsibility for and association with a heat of steel and the rails made from it extended beyond the department in which they were employed would mean greater care and better work. This plan of inspection when presented to the rail makers was cheerfully accepted with scarcely an exception.

BLOOM DISCARD

Captain Hunt was asked a good many questions about present rail mill practice. As to discard, he said the usual amount was 9 per cent. Some specifications require that shearing of the bloom shall proceed until seemingly sound steel is reached. A very few specifications call for 20 to 25 per cent. discard, and an additional charge is made by the mill in such cases. The Pennsylvania Railroad has purchased a large quantity of rails with the understanding that it would receive none rolled from the top bloom. It happened that the steel company had two rail mills, so that the top bloom could be diverted to the other mill. As to who received the rails rolled from top blooms the speaker was not informed.

Replying to the question who determines the amount of shearing where the specification provides that the bloom shall be sheared until there is no longer evidence of unsoundness, Captain Hunt said that this had led to as much dispute as any one point. For himself he insisted that it was not the inspector's duty to say when shearing should stop, for then the mill would be able to say that the inspector had passed the steel. What the inspector should do is to make careful note so that he can say that a certain bloom of a certain heat was improperly sheared, and if this is the case he should immediately report it to the foreman. The shear indeed sometimes conceals a porous condition, as it cuts through the steel as through a piece of cheese. Speaking generally about the new inspection system, Captain Hunt said that under it many heats have not gone into rails that under old conditions would have been so used. No manager can be in all parts of the works at one time, and the new system insures closer observation of every stage of manufacture. Concerning the present very large call for open hearth rails, he said that this had undoubtedly so relieved the strain upon Bessemer works that they now had a good deal less difficulty in getting sufficient high-grade Bessemer ores for their requirements.

COPPER IN RAIL STEEL

The question of copper in rails came up and Captain Hunt spoke of the order of the St. Paul Railroad for 10,000 tons of rails from steel to which a sufficient copper addition was made to give 0.5 per cent. copper in the rail. The rails were rolled by the Illinois Steel Company, and the rolling results were entirely satisfactory, there being no trouble from red shortness. The copper was added as copper wire and was introduced into the casting ladle. The idea originated with Vice-President McKenna of the St. Paul, who introduced the McKenna re-rolling process. It was based on the satisfactory results obtained from rails from Cornwall ores, where the steel had about 0.5 per cent. copper. What copper will do for rails under modern conditions remains to be seen.

Elwood Haynes considered the process of making steel quite as important as the method of working it, to produce sound rails. Automobile manufacturers are particular to introduce vanadium, nickel or some other element into the steel where it is to be subjected to shock or vibration. While carbon steel would break after 40,000 to 50,000 vibrations, vanadium or nickel steel would go to several million vibrations.

Titanium in Cast Iron

Bradley Stoughton presented a paper entitled "Notes on Titanium and on the Cleansing Effect of Titanium on Cast Iron." He gave the results, first, of a research into the quite extensive literature of titanium, and, second, of a series of original tests to determine the effect of titanium on iron castings. The results of this study, extending over more than two years, were summarized as follows:

1. Steel or cast iron, in which the titanium is properly proportioned, and which has been properly treated, is improved in strength, toughness and durability against wear, such as, for example, the wear of railroad rails, of steel and chilled iron rolls, car wheels, etc.

2. These improvements seem to be caused, not so much by the direct effect of titanium on the metal, as by its

cleansing influence in removing harmful impurities, such as oxygen and oxides, nitrogen, occluded slags, and perhaps also sulphur. It appears also to reduce segregation, which would contribute to the same end.

3. In order that its effects may be fully realized the treatment of steel or iron with titanium must be correctly performed. There are a few simple but essential details to be observed; if they are neglected the best results cannot be expected.

RESULTS DEPEND ON PROPER METHOD

Elaborating on his third point the speaker said:

To illustrate by an example: A series of tests on cast iron was carried on in a German foundry, in which scientific apparatus and instruments were employed, and great care apparently exercised in executing the work, but the titanium treatment was performed without a knowledge of the conditions which should have prevailed, and as a consequence the results were inconclusive. It is as if one should attempt to boil water with the best adapted appliances obtainable; with scientific instruments to measure the temperature and regulate the operations, and with every condition fulfilled except heating the water to a high enough temperature. Obviously, the result would be quite as unsatisfactory at 211 degrees F., as far as boiling water is concerned, as at 60 degrees, although the former point is within a hair's breadth of success. So, in adding titanium to iron or steel, if it is put into the slag, instead of the metal, or if opportunity is not given for it to be absorbed and do its work, or if the steel is subsequently allowed to become oxidized, or if the treated metal is cast much too hot or much too cold—if any or all of these important details are neglected we must not expect to get the best results.

TITANIUM AND CHILL

In the discussion on Mr. Stoughton's very thorough paper, J. E. Johnson, Jr., asked whether titanium reduced chill. If it had this effect he could not see that it was beneficial in foundry iron. The value of charcoal iron, for example, is measured by its ability to take chill. The reply of the author was that titanium does reduce chill, yet a very large majority of chilled rolls are made from titanium-treated iron, also a certain amount of car wheels. But there is an addition of manganese in the manufacture of these products, and with this and the titanium the chill is much harder and the body is tougher and stronger.

Professor Kemp told of his investigations of various deposits of titaniferous iron ores, of which there are many millions of tons north of the Lake Superior ranges, as well as in Wyoming, Colorado, Virginia and North Carolina. If these can be used they will add very greatly to our supply of available ores. He had also found vanadium and chromium in these ores, the curves of these two elements going up and down in very close sympathy, but it had not been possible to determine the relation between titanium and the chromium and vanadium content.

The Cuyuna Iron Range

Carl Zapffe, Brainerd, Minn., read a paper on "The Iron Ores of the South Range of the Cuyuna District of Minnesota," and accompanying it were comments by W. A. Barrows, Jr., on the metallurgy of these ores. Explorations by churn and diamond drilling, carried on for eight years, indicate according to Mr. Barrows 110,000,000 tons of iron ore, the average analysis of which is slightly below 50 per cent. iron, with no ore analyzing below 40 per cent. iron. Included in this estimate is 50,000,000 tons, having an average analysis of 54.60 per cent. iron. The above refers to the south range only. The north range shows a tonnage greater than the south range; it contains several producing mines and is consequently better known. In general appearance and physical structure Cuyuna ores resemble those from the Marquette and Menominee ranges. The main advantage of Cuyuna ores over those from the Mesaba range is that of better physical structure, their use insuring freedom from flue dust troubles in smelting. Mr. Barrows suggested that it would be better to widen gradually the supply of iron ores by including now in furnace mixtures such as are found on the Cuyuna range, than to defer their use until necessity compels a mixture of all low-grade ores. Those of the Cuyuna range have really no objectionable feature aside from a slightly higher silica content than is really necessary and a consequently larger slag volume.

D. T. Croxton, referring to the use of 40 to 60 per cent. Cuyuna ores in the Cleveland Furnace Company's mixture at times and to one furnace at which he knew of 90 per cent. being used, said that the results had been better than the analysis would indicate. The ores are considerably coarser than the Mesaba ores and freer in action in the furnace.

Action of Carbonizing Materials in Case-Hardening

Two papers which received much favorable comment, since they gave data not ordinarily made available by manufacturers, were those of Robert R. Abbott, Cleveland, on "A Comparison of the Action of Various Carbonizing Materials," and of Mark A. Ammon, Cleveland, who presented an investigation into the relations between hardness as measured by the Brinell and scleroscope methods and depth of carbonization in different kinds of steel hardened under different conditions. In his introduction Mr. Abbott, who is metallurgical engineer of the Peerless Motor Car Company, referred to the great importance case-hardening has:

COMMERCIAL IMPORTANCE OF THE PROCESS

The practice of carbonizing steel for the purpose of case-hardening has assumed great commercial importance within the past 10 years. Formerly case-hardened steel was held in more or less contempt, since it was considered a cheap substitute for tool steel. This is no longer the case. The development of the motor-car industry, and coincidentally that of modern alloy steels, has resulted in overcoming many difficulties formerly experienced in case-hardening. This result has been accomplished by increased knowledge regarding the analysis of the steel which would respond most readily to case-hardening, and by more careful methods of treatment of the carbonized steel.

The ordinary method of carbonizing consists in packing the steel with the carbonizing material in cast iron boxes and placing them in a furnace at a temperature of from 1500 to 1900 deg. F. for a time sufficient to give the required depth of "case." The steel is then either quenched directly from the box or is allowed to cool without unpacking, and finally given a single hardening heat, or, for special work, two or three heats.

During the year 1911 more than 100,000 tons of carbonizing material was sold in the United States, at an average price of probably $55 per ton. More than 85 per cent. of this material consisted of granulated bone. Within the past four years many manufactured compounds have been placed on the market, consisting largely of some form of carbon or carbonaceous material, with or without the addition of chemicals.

EFFECTIVE CARBONIZING TEMPERATURES

Steel will absorb carbon placed in contact with it at the temperature of the atmosphere. The reaction is exceedingly slow, but increases rapidly with increasing temperature. Below 1500 deg. F. the absorption is too slow to be commercially important. Various causes combine to make it impracticable to carbonize above 1900 deg. F. In general, carbonizing is carried out at temperatures ranging from 1550 to 1750 deg., and higher temperatures are used only when the quality is not as important as the cost. Broadly speaking, the higher temperatures can be employed for high grade work when proper facilities are at hand for a careful regulation of the temperature, and a knowledge is possessed of the correct subsequent heat treatment of the carbonized product.

When steel is carbonized, the carbon does not penetrate in a gradually decreasing content from a high carbon exterior to the uncarbonized core, but rather in a series of steps; for example, there is usually present a considerable zone of the eutectoid composition, which in the present paper has been assumed to contain 0.90 per cent. of carbon.

Many of the commercial materials behave differently in carbonizing, and even under exactly the same conditions of time and temperature different depths of penetration or different per cents. of carbon or both are obtained. In order to produce good results in case-hardening a uniform material must be used, and the treatment of the steel subsequent to carbonizing must be suited to the nature of the case produced.

TWENTY-FIVE MATERIALS INVESTIGATED.

Mr. Abbott's investigation was undertaken to compare most of the important commercial carbonizers as to cost and rapidity of carbonizing and the nature of the resultant carbon zones. He considered the usual method of investigating by carbonizing small bars for different periods and then turning off successive layers and analyzing for carbon to be unsatisfactory since two bars showing practically the same carbon content might be carbonized in quite different ways, so that the same subsequent heat treatment would produce decidedly different results. The method he employed was the result of four years' study. Twenty-five materials were investigated—pure bone, bone in which the glue has been partly or wholly extracted, bone mixed with other carbonaceous material, partly roasted nuts, husks and kernels of seeds or beans, charred carbonaceous materials heavily charged with chemicals. No compressed

gases were employed, but only the gases given up by the various materials. The paper gives nearly 40 pages of tables and diagrams showing the results of the very extensive investigations as to depths of the zones of carbon produced by the various materials at different temperatures for varying times. The author considers the repeated use of material unsatisfactory. Mixing part new and part old is objectionable since at plants where a variety of carbonizing is done the old material is not uniform, having been used at different temperatures and for different lengths of time.

One of the tables gives the relative cost of carbonizing to a given depth with different materials. The use to which the steel is to be put should decide in selecting the material and in fixing the temperature of carbonization. Various examples were given in the paper showing the practical use to which its data can be put. The importance of a knowledge of the heat treatment necessary to put the work in the best condition after carbonizing was also emphasized.

Measurements and Relations of Hardness and Depth of Carbonization

The introduction to Mr. Ammon's paper, which also dealt with case-hardening, gave the following statement as to the object of his investigation:

The two most widely used methods of measuring hardness are the Brinell and the scleroscope. In the Brinell method a hardened steel ball is pressed into the steel under a definite load and the area of the resulting depression is measured. The load in kilograms per square millimeter of the area of the depression is taken as a measure of the hardness. Within certain limits the hardness number so determined is independent of the load or the size of the ball. In the scleroscope method a small weight carrying a diamond point is dropped through a glass tube upon the steel and the amount of rebound is taken as proportional to the hardness.

In both methods the scale of hardness is an arbitrary one; however, they agree in a comparative way, that is, a steel showing 50 per cent. harder Brinell will show approximately 50 per cent. harder scleroscope. Yet upon consideration of the two methods it appears that upon a steel which has been carbonized this should not be the case; for the scleroscope method gives almost exclusively the surface hardness, and the condition of the material below the surface has but a slight bearing upon the hardness number. The results given by the Brinell method should, however, be the exact opposite; for the depth of penetration of a ball pressed into the steel would be dependent to a large extent upon the condition of the material below the surface. This is particularly obvious when it is considered that the size of the ball ordinarily used in the Brinell method is 1 cm. (about ⅜ in.) in diameter under a load of 3000 kg., while the diamond point of the scleroscope is in the neighborhood of 0.01 in. across, fitted in a hammer of about 0.5 oz. weight and dropping from a hight of 10 in.

It was thought that an investigation into the hardness of a case-hardened steel by means of a combination of these two methods might lead to the development of a process whereby the depth of carbonization could be determined within a reasonable degree of commercial accuracy.

It was seen at once that the ordinary size of steel ball used in the Brinell method would not do, since the size of the depression would be so great that a finished piece would be more or less injured by it. A special attachment was therefore made for the machine, which accommodated a ball 0.25 in. in diameter, and this was used in combination with a weight of 5000 lb. Instead of measuring the diameter of the resulting depression, the length of penetration was measured to 0.0001 in.; and by ordinary geometrical methods a formula was determined to give standard Brinell readings.

BRINELL AND SCLEROSCOPE RESULTS COMPARED.

In discussing the results the paper points out that in testing hardness after carbonizing and before quenching the most apparent fact was the higher scleroscope reading after carbonizing compared with the reading before carbonizing, while the corresponding Brinell readings were but slightly higher in the case of one steel and actually lower in another. The explanation is that the scleroscope method, being influenced largely by the surface conditions, measures the increased hardness due to the higher carbon. The Brinell hardness, being more a function of the core than of the surface, is actually made less for the lower depths of carbon due to the soft annealing produced by the slow cooling in the carbonizing boxes. After quenching from the carbonizing box the scleroscope readings show a gradual decrease in hardness with increased depth in carbon after the first hour of carbonization. The Brinell hardnesses show some slight irregularities due to differences in cooling rate caused by mechanical difficulties of quenching from the large carbonizing boxes. However, the curves show an increase in hardness from 4 to 6 hr. and then the hardness becomes practically stationary. The explanation is that the influence of the core decreases, while the influence of the case increases as the depth of the carbon becomes greater; therefore as soon as the depth becomes great enough to cause the core influence to become negligible the hardness ceases to rise and then decreases. This decrease, as with that shown by the scleroscope, is thus explained. With increasing depths of carbonization the percentage of carbon in the surface becomes higher; in quenching from this high temperature the austenite-forming tendencies increase with increasing depth, and the higher the percentage of austenite the lower the hardness.

BRINELL HARDNESS AND CONDITION OF THE CORE.

In giving the results of the hardness tests after second quench on double-quenched specimens the paper stated that the Brinell hardness did not reach that of the first quench except for the higher heats of carbonization. The results gave all the data necessary for determining the depth of carbonization at which the condition of the core ceases to have any influence upon the Brinell hardness. This is approximately at the point where the Brinell reading on the second quench is the same as that on the first quench, or about 0.11 in. deep.

In conclusion it was stated that the knowledge gained by the research work detailed in the paper had formed the basis of a system of testing carbonized parts for depth of carbonization and efficiency of the heat treatment.

THE SCLEROSCOPE AND THIN AND THICK PIECES.

In the discussion of Mr. Ammon's paper a question was raised as to the results with the use of the scleroscope. J. E. Johnson had used it to test thin discs and also pieces 1 in. to 1¼ in. thick. He considered that mass has a good deal to do with results in hardness testing, also the resilience of the anvil. The question was how to overcome the variations due to these two causes. Mr. Ammon in reply said he considered the scleroscope to be only a measure of surface elasticity and that its results were not a function of the core or of anything that might be used to support the piece. Mr. Stoughton suggested that probably Mr. Ammon had found the substances he tested to be harder than the anvil. Mr. Shore, the inventor of the scleroscope, had admitted that thin pieces present difficulties. Mr. Stoughton had found that the effects of the anvil appeared in the case of soft pieces. In view of the great importance of the question of hardening he considered the institute was under obligations to the companies which had permitted the publication of the data contained in the papers of Messrs. Abbott and Ammon. The data in existence on case-hardening, hardness tests, etc., are voluminous, but very little has been given for publication.

Cooling Phenomena in Carbon-Iron Alloys

Bradley Stoughton, in the absence of Prof. H. M. Howe, gave a synopsis of the latter's extended paper dealing with Ruff's "Carbon-Iron Equilibrium Diagram." The paper was highly technical and dealt with phases of the phenomena of cooling which are little understood by the average iron and steel metallurgist. Professor Howe's investigations were carried out in the metallurgical laboratories of Columbia University, in part under a grant from the Carnegie Institution of Washington. Professor Howe shows that the unexplained variations in the cooling curves of Gutowsky are very great and that the rate of graphitization in the cooling of iron is very capricious; also that the separation of graphite continues at temperatures far below those to which Professor Ruff seems to confine it. Mr. Stoughton also presented some data prepared by N. M. Wittorff and originally published in the Russian language. The result of Wittorff's study, he said, had been to extend greatly our knowledge of hypereutectic alloys of iron and carbon.

The comment on the subject as presented by Mr. Stoughton brought out the view that much more practical use will in time be made of the investigations into the phenomena of the cooling of iron so far as it relates to carbon conditions. H. D. Hibbard mentioned the fact that wash metal does not solidify as cast iron does, but passes through a mushy stage. It was suggested that the absence of silicon in wash metal was doubtless the cause of this phenomenon, in view of the well known effect of silicon

upon carbon conditions. One member suggested that with the increase of knowledge of the changes taking place in the solidification of molten iron better control would be possible of the product of the blast furnace, whether of white or gray iron. Professor Kemp said that in the cooling and crystallization of great masses of rock geology had recognized the same processes as are observed in alloys of iron and steel, the study of the structure of igneous rocks in the field showing parallels with the structure of alloys as shown by metallography.

Blowing in a Blast Furnace

The first paper of Tuesday afternoon was by R. H. Sweetser, superintendent Columbus Iron & Steel Company, and gave the results of the writer's extensive experience in blowing in blast furnaces. The practice which he detailed had gradually developed to a point where the results are sure, safe and satisfactory. The most critical points in blowing in are the placing of the kindling wood, the bringing down of the gas, the closing of the iron notch and the first cast. The paper described the method of drying out the furnace by the building of a "Dutch oven" outside one of the tuyeres and the use of coke for fuel. The paper described the use of an iron pipe 3 or 4 in. in diameter and about 10 ft. long in the iron notch, the object being to burn completely all the kindling wood below the tuyeres before the slag falls into it and also to heat up the hearth bottom thoroughly. As soon as the blast is on the furnace the gas will come out through this pipe into the iron trough, where there should be a wood fire to ignite it immediately. Near the outer end of the pipe are four holes in which to insert hooks for pulling it out when the time comes. As the volume of gas increases the gas flame at the end of the pipe gets hotter and roars more but does no harm. The practice of the author has been to let this gas burn at the iron notch for four hours after starting the blast and then to pull the pipe and shut the notch.

PUTTING ON THE BLAST.

The paper gave details as to filling the wood and filling the stock. The portion relating to putting on the blast is as follows:

> I believe in putting the blast on at once, and using hot blast to light the furnace whenever stoves are available. If the volume of blast is increased properly, the furnace will not "hesitate," but will move off easily, and the first slip will be indefinitely postponed. If the stoves have not been previously heated with gas, then red hot rods are thrust in through the tuyeres to light the kindlings.
>
> If the furnace is a single stack and the gas-flues are cold and empty, the method of "bringing down the gas" is different from the way when there are one or more furnaces in blast and delivering gas into the same gas mains.
>
> When the blast is turned on a single stack, both bells and the top bleeders are left open for a while and not closed until there is a steady and voluminous flow of gas at the top of the furnace. The big bell, and then the little bell, are closed, and all the gas goes out of the bleeders. All gas burners on stoves and boilers are tightly closed, and all fire is kept away from dust catchers and cleaning doors. The gas mains are gradually filled with the dense white furnace gas by partly closing the bleeders. At the farthest end of the gas main gas is allowed to escape through a valve or a cleaning door, so as to expel all the air in the mains. When gas is leaking through all the cracks of doors and burners, and there is pressure inside the gas main, the last gas burner under the farthest boiler is slowly opened, and the gas is lighted by the fire on the boiler grate. The bleeders are then closed so as to force all the gas into the mains. By having the mains full of gas at a pressure of a few inches of water, the danger of explosions is averted. The very dangerous quality of the blowing-in gas is shown by the analyses I made and recorded in our Transactions, but all trouble can be avoided by proper handling of the gas. Great care must be taken not to open gas burners faster than the volume of gas will allow; as the volume and pressure increase, the burners at the stoves can be opened.
>
> In the case of "twin" furnaces, all these precautions can be omitted and the gas from the new furnace can be soon turned into the gas mains by closing the bells and bleeders. Of course, the gas valve between the new furnace and those already in blast must be opened just before the blast is turned on.
>
> I will not attempt to give in exact cubic feet the amount of blast that should be blown during the first hours of blowing-in; but the volume at all times during the first day or two should be sufficient to prevent much blast pressure on account of "hesitating" in the settling of stock. While the wood is burning the blast volume should be sufficient to prevent gas from coming back in the tuyeres by reason of the pulsations of the engines. I usually start with 25 per cent. of the normal blast.

OPENING THE IRON NOTCH.

Where slag is used in filling the furnace the paper suggested flushing out a considerable amount before attempting to open the iron notch. The latter operation is not difficult providing the keeper drills in on the level and through the soft clay that fills the hole left by the 4-in. pipe. Sometimes a big tapping bar is driven into the soft clay as soon as the iron notch is shut for the first time, but the writer had found several disadvantages in this and preferred to leave the bar out.

Some records of blowing in at Columbus, Ohio, according to the method described were cited in the paper. In one case the furnace had very hot stoves to start with and the blast temperature exceeded 1400 deg. On this account the blast volume was increased more rapidly than usual and the first cast was only 13 hours after the blast went on.

In the discussion Mr. Johnson referred to the danger of explosions in bringing down the gas and said that filling the downcomer with steam afforded a cushion between the gas and the air and prevented the mixing of the two. He had found it good practice in this connection to put on more blast than normal. By the use of the steam cushion he had brought down the gas in 10 minutes. Another suggestion was to put clay mixed with coke breeze over the tap hole. Drilling through this soft mass was easy. He considered Mr. Sweetser's use of the iron pipe in the iron notch one of the best expedients he had heard of.

Alloys of Cobalt with Chromium and Other Metals

Elwood Haynes, Kokomo, Ind., in a paper entitled "Alloys of Cobalt with Chromium and Other Metals," told of his experiments in the search for metallic alloys which would resist oxidation and other harmful influences and have valuable physical properties. In a paper read a few years ago Mr. Haynes had described the properties of an alloy of nickel and chromium. Later he produced an alloy of cobalt and chromium and had added to the cobalt chromium alloys the non-metallic elements carbon, silicon and boron. Tungsten, he had found, alloys readily with chromium and cobalt in all proportions, producing a harder and more elastic alloy, especially if it contains a small amount of carbon, boron or silicon. When the tungsten reaches 40 per cent. or more the alloy becomes so hard that it will not only scratch glass but will readily scratch quartz crystals.

Records were given by Mr. Haynes of the work done by a ⅜-in. square cast bar of the alloy, which he called stellite, after having been ground to a suitable edge and set in a tool holder attached to a lathe. With a steel tool of the same size, 26 cast iron wheels had been ground in 10 hours. The stellite tool turned 49 of these wheels to form in the same time. The steel tool was ground 50 times in the operation while the edge of the stellite tool was dressed slightly with a caborundum whetstone after its day's work. In another case a cylindrical bar of annealed nickel-chrome steel 2.5 in. in diameter was placed in a lathe and turned with a steel tool at as high a speed as the steel would permit without burning. The steel tool was then replaced by one of stellite and the speed increased 2 2/3 times. The stellite retained its edge under these conditions and produced a shaving weighing 1.2 lb. in 30 sec. In this connection the author said: "Just what the effect of the alloy will be in machine shop practice is at present somewhat difficult to determine. In my opinion, however, it will not fully supersede high speed tool steel in the machine shop, but in cases where rapid work is the main consideration it will doubtless replace high speed steel."

Professor Kemp said that the surprising thing was that two such brittle substances as chromium and cobalt could make so tough and strong a metal. Mr. Haynes said that while stellite showed unusual resistance to corrosion and to the action of acids it was most affected by hydrochloric acid. The distinction of stellite was its ability to cut more rapidly than carbon steel rather than its ability to cut material which could not be cut satisfactorily by carbon steel. The tensile strength varies greatly. Some tests had shown an elastic limit of 85,000 lb. and a tensile strength of 110,000 lb.

Considerable time was given to the reading and discussion of three papers on the manufacture of by-product coke by W. H. Blauvelt, Syracuse, N. Y.; F. E. Lucas, Sydney, Nova Scotia, and C. W. Andrews, Duluth, Minn.

(*Continued on page 1120.*)

ESTABLISHED 1855

THE IRON AGE

Published Every Thursday by the

David Williams Company

239 West 39th Street New York

W. H. Taylor - *President and Treasurer*
I. A. Mekeel - - - *First Vice-President*
Fritz J. Frank - - - - - *Secretary*
M. C. Robbins - - - *General Manager*

Editors

Geo. W. Cope A. I. Findley W. W. Macon

Charles S. Baur - - *Advertising Manager*

Branch Offices

Chicago: Otis Building Philadelphia: Real Estate Trust Bldg.
Pittsburgh: Park Building Cleveland: American Trust Building
Boston: Compton Building Cincinnati: Mercantile Library Bldg.

Entered at the New York Post Office as Second-class Mail Matter

Subscription price: United States and Mexico, $5.00 per year; to Canada, $7.50 per year; to other foreign countries, $10.00 per year.

CONTENTS.

Making a Success of the Machine Shop..... 1075
Engaging Heavily in the Fuel Oil Trade..... 1078
The Battleship New York Launched..... 1078
Jarring and Turn-Over Molding Machine..... 1079
National Founders' Convention..... 1079
A Recent Type of Factory Construction..... 1080
Customs Decisions 1082
Electro-Magnetic Speed Indicator for Shafting..... 1083
An Improved Metal Slitting Machine..... 1083
Tests of a Boiler 24 Tubes High..... 1084
Large Motor-Driven Pit Planing Machine..... 1085
New Construction for Blast Furnaces..... 1086
Canada's Merchant Marine 1087
A New Small Revolving Steam Shovel..... 1088
Lighting Fires in Cupolas..... 1088
The Foundry & Machine Exhibition Company..... 1088
The Vauclain Drill, a New Tool..... 1089
Lackawanna Talbot Furnaces..... 1089
Do Employees' Benefit Associations Pay?..... 1090
To Buy Motors for Costa Rican Boats..... 1091
Cutter, Reamer and Drill Grinding Machine..... 1091
Improved High-Speed Hack Saw Machine..... 1092
Spring Lock Washer for Bolts..... 1092
Revised Figures for Copper, Lead and Zinc..... 1092
Increased Safety in the Use of Lathe Dogs..... 1093
The Italian Scrap Iron Market..... 1093
Stagger Feed Spacing Table for Presses..... 1093
A Story of a Visit to Sir Henry Bessemer..... 1094
American Institute of Mining Engineers..... 1096
Open-Hearth and Bessemer Steel..... 1100
Care in Taking Business Medicine..... 1101
The Compulsory Working of Patents..... 1101
Correspondence 1102
Additions to the Cambria Steel Company's Organization..... 1102
The Westinghouse Air Brake Company's Growth..... 1102
Blair Ports Solve a Water Problem..... 1102
Complete Production Statistics for 1911..... 1103
Changing to Gas Equipment..... 1103
Boiler and Structural Rivet Extras..... 1103
Large Gains in Pig Iron Output..... 1104
Pittsburgh and Vicinity Business Notes..... 1105
The Iron and Metal Markets..... 1106
Personal 1119
Obituary 1119
Some October Records 1121
The Forged Steel Wheel Company Expands..... 1121
New Publication 1121
Effect of Alumina in Blast Furnace Slags..... 1122
Canada's Steel Makers Ask Adequate Protection..... 1124
Crucible Steel Company of America..... 1125
Thorough Observations in Boiler Testing..... 1126
The Thomas Meter as a Large Consumer's Meter..... 1130
The Steel Corporation Dissolution Suit..... 1131
Manual Training School Electric Drives..... 1132
New Tools and Appliances..... 1133
The Machinery Markets..... 1134
Trade Publications 1142

Open-Hearth and Bessemer Steel

Complaint is being made by steel finishing mills that customers frequently insist upon getting open-hearth steel when Bessemer steel would really meet all their requirements. Of course it is admitted on all hands that there are cases in which open-hearth steel is so much preferable to Bessemer that there is no room for argument, but it is insisted that there are many cases in which there is really no physical ground for a preference, and that the leaning of the customer toward open-hearth is based upon psychological rather than upon physical reasons. In such cases, it is claimed, the buyer has really no first hand information as to the relative merits of the two descriptions of steel as applied to his particular uses, but is simply influenced by the extensive advertising which has been given open-hearth steel in the past few years.

A great deal has been published, for instance, as to the better quality of open-hearth steel rails as compared with Bessemer, and this preference influences buyers of finished steel which has duties to perform in nowise connected with the duty placed on rails. Indeed, there is no necessary connection at all, for the question is of soft steel, and not of high carbon steel involved in rails. Again, many finishing mills have adopted the open-hearth process exclusively, and in some cases the choice was dictated by financial or purely commercial considerations, such as the ease with which open-hearth plants of relatively small capacity can be built, or the difficulty of securing adequate deposits of Bessemer ore. Once such producers are committed to open-hearth steel, however, they make the most of the fact in their advertising literature, and this constant drumming has had its effect on consumers.

In one branch after another of the finished steel trade open-hearth steel has become dominant. The preference has now become so strong in the case of rails, structural shapes and plates that Bessemer steel occupies an entirely subsidiary position. In tubular goods and sheet products, including tin plate, Bessemer steel is still dominant in point of tonnage, but open-hearth steel is gaining in popularity. To adopt open-hearth steel for these products, some difficulties have had to be surmounted. Open-hearth steel pipe did not thread well at first, and for a time this constituted a distinct drawback, but this has now been overcome. In the rolling of sheets, whether sheet mill style or tin mill style, there was trouble from the soft open-hearth steel sticking in the pack, and this presented a serious problem. While this has been conquered in a measure, the fact remains that it is easier to roll Bessemer steel than open-hearth steel in a sheet or tin mill. The last stronghold of Bessemer steel probably lies in drawn wire, but even in that field there is now much open-hearth steel.

Somewhat better deliveries of finished steel products could be made at this time if there was more willingness to accept Bessemer steel in certain finished forms, in cases in which this variety of steel would readily answer all requirements. It is safe to assert that delivery of considerably more Bessemer steel would be accepted by buyers if their choice was directed solely by their own knowledge and experience—in other words, if no one demanded open-hearth steel except those who had definite knowledge that it was really requisite for their purposes.

Against the popular impression in some quarters that the paramount fact in steel quality is that open-hearth

steel is superior to Bessemer, it may be pointed out that the researches and experiments of the metallurgists directed toward the production of sound ingots are not aimed exclusively either at the Bessemer or the open-hearth ingot. The attitude of the metallurgists is not that it is the Bessemer ingot which needs to be made sound, because the open-hearth ingot is already satisfactory, nor is it that it is the open-hearth ingot that needs to be made sound because the Bessemer ingot presents a hopeless case. Their position is that the ingot, almost irrespective of whether it is Bessemer or open-hearth, requires to be improved. The faults which they are endeavoring to correct—of piping, segregation, blow holes, etc.—are not confined to either class of steel; they are simply in the steel ingot.

It is fortunate, in the rapid trend of favor toward open-hearth steel, that the total demand for steel has been augmenting so heavily. This has permitted a rapidly increasing proportion of buyers to be given open-hearth steel without so greatly decreasing the Bessemer steel production. In the past half dozen years the total increase in steel production has been taken care of by the open-hearth process, and somewhat more. Had the total steel requirements not increased, the case would have been made much more serious, for a very large amount of Bessemer steel capacity would have been rendered useless. Thus, in 1906, the year of maximum Bessemer steel production, the 12,275,830 gross tons of Bessemer steel ingots and castings produced constituted 52.5 per cent. of the total production of steel ingots and castings, while in the first half of this year the proportion of Bessemer steel dropped to 34 per cent. If the total steel demand had remained constant, this would have been equivalent to writing out of the reckoning about 4,300,000 tons of Bessemer capacity, in addition to any which might possibly have been idle in 1906. The larger part of the increase in open-hearth steel, however, is provided for by the general increase in steel demand, so that at present Bessemer steel is probably being produced at the rate of somewhat more than 10,000,000 tons a year, or at a rate only 10 or 15 per cent. below the rate in 1906.

Even with the growth in steel demand, Bessemer capacity is becoming superfluous at points. There has been in isolated cases a complete abandonment of such capacity, the first instance being of the Bessemer department at Duquesne, which in 1907 disappeared, open-hearth furnaces being built on the ground. At the Homestead Steel Works the Bessemer department ceased operations at about the same time, although the equipment has not been removed. At other points arrangements have been made to duplex, the Bessemer equipment being relegated to the minor position of preparing blast furnace metal for the open-hearth furnace. The latest development in this direction is at Buffalo, where two Talbot furnaces are being built to take metal prepared by Bessemer vessels which formerly made Bessemer steel.

Had sufficient Bessemer converter capacity been suitably positioned to serve open-hearth furnaces, whether in existence or possible of construction, the industry might pass through the transformation without the abandonment of any equipment, but such has not been the case, and at several points it has been necessary, in order to practise the duplex process, to erect new Bessemer vessels. This has been done, for instance, at South Bethlehem and at Aliquippa. It is only occasionally that it is feasible to introduce duplexing and use existing Bessemer converters.

Care in Taking Business Medicine

Give a thinking man an opportunity to get acquainted with the average industrial establishment and he will find points susceptible of improvement. He makes his inspection with a broad view of things and has not the long-time intimacy which tends to bring the subject so close to the eyes that like the manager he can see only one or two spots at a time, albeit his view may be microscopic. Let the manager have mechanical leanings and he magnifies production; let him be a salesman first and a mechanic second and he becomes an executive who unconsciously permits an unbalanced condition in his works. Cases are not uncommon of the manufacturing department turning out articles for which there is a poor market, though the articles themselves are exemplary. Sales departments have been known to oversell manufacturing capacity or to take orders for articles difficult or unprofitable for the works to produce. Conditions like these call for that application of scientific management which aims not so much to uproot existing things throughout a plant as to effect a perfect balance among departments.

The situations described are not new. Indeed they exist in plants which are supposed to be run with some idea of good management. They are an outcome of a confusion between management as an art and management as a science. Good ideas obtained here and there are applied as the judgment dictates, but the process is a hit-or-miss or cut-and-try method of trying to reach scientific bases. The management is constantly finding some phase of the manufacturing, distributing or executive departments of the business out of joint and in attempting to correct the trouble by concentrated attention to it perceives that some other part of the system has buckled. Industry in general has been built up as an art, and the head of it is to be excused if he does not apprehend the scientific relation of all parts. In fact, the purely scientific foundation of business appears to be known to very few, but it remains for every manager to seek to build upward or to deduce proper procedure from the fundamentals rather than to reverse the order by applying palliatives without locating the disease. A scientifically erected business ought to possess as many gauges as there are departments and each should show when things are not going well and the cure of one department should be effected without disturbing the gauges of the others.

The Compulsory Working of Patents

Samuel W. Banning, in his able address on patent protection delivered before the National Machine Tool Builders' Association at the recent convention, made an interesting point against the system of compulsory working of patents as contained in the Oldfield bill, as follows:

It frequently happens that inventors and manufacturers, after years of experimentation, find that the results sought can be adequately accomplished in any one of several ways. To secure adequate protection it becomes necessary to procure a line of patents covering several different forms of the same general invention. These patents are frequently the basis of an entire manufacturing business, and they afford the only means whereby a small manufacturer can compete in the market against his stronger adversary employing other means to the same end. To permit the latter to enter the same field by procuring a license under unworked patents covering alternative ways of doing the same thing is to break down a competing business and develop monopoly the stronger rather than to restrain it, and this will be the

result if the Oldfield bill is enacted in its present form, as I firmly believe.

This is one of the strong arguments against the principle. Yet the case of the small manufacturer who would suffer under the conditions as stated should not be common. His right to use the unworked inventions of others should be a strongly compensating advantage. In Europe, where compulsory working is thoroughly established, scant attention has been paid to this phase of the law's operation. In the argument as stated the small manufacturer would have to possess more than one patented method each better than those employed by his powerful competitor. He would have his choice of his own inventions, and might work more than one of them, if necessary, for the protection of his patents. A more likely case would be that of the large manufacturer owning a number of patents bearing upon the same manufacturing function, who would be the sufferer, because he would have to work all of his inventions in order to prevent a small competitor from seizing upon one or more of them and acquiring the right to use them, as provided by the law.

Compulsory working of patents, like any other principle of law, must have its weaknesses, but it has been shown that they do not begin to counterbalance the great good that should come to American industries with the adoption of the system, both in the relations as between home competitors and in those between the American manufacturer and his competitors of other countries. The fact remains that, under the patent laws of other countries, Americans are compelled to establish branch works in such countries, or to license their patents to foreigners, if their inventions are to be preserved. As our patent law now reads, the foreigner protects his inventions in this country and need never work them here nor permit others to work them, completely guarding his home factory and the people dependent upon it, from the danger of competition from the United States. Compulsory working would result in the establishment of branches of foreign works in this country, or the working of foreign inventions here under license and, possibly, reciprocal treaties wherein the citizens of this and other countries would be held mutually exempt from the burdens of such a provision.

Correspondence

Professor Howe's Tribute to Maunsel White

To the Editor:—May I add a word of appreciation of Maunsel White? It is not so much his extraordinary intellectual gifts, his subtle penetration and clear analysis that we remember him by as his most sterling and lovable nature. An ardent Catholic, he represented to us what is best and most generous in Catholicism. He was always generous in his judgment of his fellows, and could always find a justifying or at least a palliating point of view for their errors. Those errors were to him not sources of pride, because he was not subject to them, but of regret that the erring were. Here was

> A brave and generous manhood,
> Still an honor without stain.

There are not a few of us who, looking back on our lives, must count among our great privileges that we have been permitted to know him and to labor with him.

HENRY M. HOWE.

BEDFORD HILLS, NEW YORK, November 4, 1912.

An impressive collection of books on aerial engineering is housed in the Engineering Societies Building.

Additions to the Cambria Steel Company's Organization

W. H. Donner, president Cambria Steel Company, has appointed E. E. Slick general manager and H. W. McAteer comptroller, with headquarters in Johnstown. Both positions are new and additions to the present organization. Mr. Slick's first position was with the Cambria Iron Company in Johnstown. He left the drafting room there 22 years ago, going to the Edgar Thomson steel works, where he afterward became chief engineer, remaining in that position for six years, until the formation of the United States Steel Corporation. Since that time he has been chief mechanical engineer of the Carnegie Steel Company. In this period Mr. Slick has also been associated on the board of engineers of the Steel Corporation in the building of the Duluth and Gary plants. Mr. McAteer leaves the position of assistant auditor of the Carnegie Steel Company, with which company he has been employed for 17 years.

J. L. Replogle, who was recently made a vice-president of the Cambria Steel Company, and who was assistant to the former president, C. S. Price, will be Mr. Donner's right-hand man in the commercial end of the business and has been appointed general manager of sales.

The Westinghouse Air Brake Company's Growth

The Westinghouse Air Brake Company, Pittsburgh, Pa., recently made application for the listing of its shares on the New York Stock Exchange, and in connection with this gave a statement of its financial condition, from which the following interesting information is extracted:

Since the original organization of the company its authorized capital has been increased from time to time, as follows:

Authorized at organization	$ 500,000
Authorized April 2, 1872	600,000
Authorized October 23, 1886	3,000,000
Authorized January 6, 1888	5,000,000
Authorized July 12, 1898	11,000,000
Authorized January 31, 1908	14,000,000
Authorized July 10, 1912	20,000,000

Of which there is now issued and outstanding $18,323,266.67.

All of the increases represent surplus from earnings and investments and were distributed as stock dividends, except the increase to $5,000,000 in 1888, of which $1,000,000 was sold for cash and $1,000,000 distributed as a stock dividend; and the increase to $11,000,000 in 1898, of which $5,000,000 was distributed as a stock dividend and $1,000,000 was used for the purchase of patents and the increase of manufacturing facilities. Average cash dividends have been paid as follows:

From 1875 to 1886, inclusive, 52 per cent. per annum.
From 1887 to 1898, inclusive, 27½ per cent. per annum.
From 1889 to 1907, inclusive, 23 per cent. per annum.
From 1908 to 1911, inclusive, 16¼ per cent. per annum.

The company has no funded debt. On July 31, 1912, it had a surplus of $4,406,420.98 and a contingent surplus consisting of the excess over the par value of the capital stock of subsidiary companies as shown on the company's books amounting to $1,750,000.

Blair Ports Solve a Water Problem.—The Youngstown Sheet & Tube Company, Youngstown, Ohio, is equipping two of its open-hearth furnaces now under construction with Blair ports. Owing to dirty water and insufficient supply available for cooling purposes, it plans to use the water for the boilers first through the ports. This is a simple solution to the water problem at plants where it is desired to use Blair ports, but where the present water, which might be used for the purpose, is dirty and chemically impure. A further advantage of using the boiler water first through the ports is to benefit by the rise in temperature of the water, the ports acting in the capacity of a pre-heater, which results in a saving in fuel at the boiler house. Very little additional expense is incurred by using the boiler water first through the ports, requiring as it does only a small amount of extra piping.

The Republic Iron & Steel Company, Youngstown, Ohio, has placed an order with the Raymond Concrete Pile Company, Pittsburgh, for reinforced concrete piles and foundations for the three new hot blast stoves being added to one of its furnaces.

Complete Production Statistics for 1911

James M. Swank, vice-president and general manager of the American Iron and Steel Association, Philadelphia, Pa., has just issued Part II of his Annual Statistical Report for 1911. It fills 63 pages, giving production statistics for those branches of the trade not covered in Part I and also presenting a most comprehensive array of statistics of the production of iron and steel, iron ore and coal in foreign countries. In the following table, taken from the report, a summary is presented of the production of leading iron and steel commodities in the United States in 1911, compared with 1910:

	1910 Gross tons	1911 Gross tons
Total production of pig iron, including spiegeleisen and ferromanganese	27,303,567	23,649,547
Production of spiegeleisen and ferromanganese	224,431	184,718
Production of Bessemer steel ingots and castings	9,412,772	7,947,854
Production of open hearth steel ingots and castings	16,504,509	15,598,650
Production of crucible steel ingots and castings	122,303	97,653
Production of all other steel	55,335	31,949
Total production of crude steel, including steel castings	26,094,919	23,676,106
Production of open hearth castings	863,351	571,191
Total production of steel castings	940,832	646,627
Production of Bessemer rails	1,884,442	1,053,420
Production of open hearth rails	1,751,359	1,676,923
Total production of rails	3,636,031	2,822,790
Production of structural shapes	2,266,890	1,912,367
Production of wire rods	2,241,830	2,450,453
Production of plates No. 12 and thicker	2,807,728	2,334,341
Production of sheets No. 13 and thinner	2,147,756	2,153,708
Production of black plates for tinning	712,137	795,598
Production of tinplates	722,770	783,960
Production of nail plate	45,294	48,522
Production of tie plates	213,259	170,435
Production of merchant bars	3,785,731	3,047,362
Production of concrete bars	241,109	258,741
Production of skelp	1,828,194	1,980,673
Production of hoops	262,214	225,074
Production of cotton ties, etc.	424,979	342,810
Production of splice bars	223,022	163,570
Production of forging blooms	459,933	231,115
Production of sheet piling	26,598	22,827
Production of steel railroad ties	49,048	39,197
Production of other forms of rolled products	1,174,922	1,005,621
Total production of rolled products	21,621,279	19,039,171
Production of charcoal blooms	75,974	64,616
	Kegs	Kegs
Production of cut nails	1,005,233	967,636
Production of wire nails	12,704,902	13,437,778

The report, both parts, is for sale by the association at $5 per copy.

Changing to Gas Equipment

Action of Milwaukee Manufacturers Now Using Fuel Oil

Among the manufacturers of Milwaukee the matter of greatest concern is the question of a substitute for fuel oil. The Milwaukee Electric Railway & Light Company, which has a water power plant at Kilbourn, Wis., and is now delivering current for power purposes in Milwaukee, is offering to local industries, particularly the crucible steel foundries, a maximum demand power contract under which power will be supplied for 7 mills per kilowatt hour. While it is still to be demonstrated that the electric furnace can compete in the steel foundry with the converter or open-hearth furnace, this unusually low rate is arousing considerable interest and will result in a thorough investigation of the possibilities.

The Allis-Chalmers Company is under the necessity of making extensive changes in its annealing and forging departments, in view of the recent notice from the Standard Oil Company of Indiana that it will not sell fuel oil; it is understood, however, that under the receivership some delay will attend the authorization of the necessary expenditure for this remodeling and oil is being purchased from independent interests pending the ultimate installation of a producer gas plant.

The Falk Company has placed a contract for the installation of a battery of six gas producers. For these and for coal bunkers, coal trestle and handling equipment an expenditure of about $60,000 will be necessary.

The Sivyer Steel Castings Company, which has in operation the largest crucible capacity in the country, has under way the building of a new foundry of steel and concrete construction, in which a 1-ton Tropenas converter will be installed. It is hoped that this installation will be ready for operation by December 15. In the meantime this company has contracted for 200,000 gal. of oil from the Southwestern field to continue the operation of the crucible plant until the converter is in operation. For the new construction about $50,000 is being expended. It is believed that the crucible oil burning furnaces will continue to be serviceable for the making of special analysis steels where the character of the steel will justify the higher cost of fuel.

Some of the steel foundries have not yet decided upon the changes to be made. Among these is the Prime Steel Company, whose situation is not an uncommon one. At the time when a number of oil burning open-hearth furnaces were installed no provision was made for regeneration, and now, with the necessity for burning gas from which the necessary temperatures cannot be obtained without regenerative chambers, a heavy remodeling expense is involved.

The National Brake & Electric Company, which has oil burning open-hearth furnaces of a tilting type, is preparing for the installation of gas producers.

For those shops which have oil installations for miscellaneous purposes, as in the boiler and structural shop for heating rivets, or for small forges, or in the gray iron and malleable foundries, the only practicable resort seems to be a return to coke and coal until a gas producing unit or other fuel supply on a small scale can be devised which will justify the initial cost and be as efficient as the large plant.

Boiler and Structural Rivet Extras

Following is the revised list of base sizes and extras adopted unanimously October 15 by the manufacturers supplying rivets to the railroad, structural and commercial trades:

Base Sizes

Boiler rivets, standard heads—¼-in. to 1¼-in. diam. incl.; 2 to 5 in. length incl.

Structural rivets, standard heads—¼-in. to 1¼-in. diam. incl; 2 to 5 in. in length incl.

Ship rivets, standard heads (straight necks)—¼-in. to 1¼-in. diam. incl.; 2 to 5 in. in length incl.

Above in kegs or bags, weighing approximately 200 to 300 lb.

Standard Extras

	Per 100 lb.
1. ½ in. and 9/16 in. diameters	$0.50
2. ⅝ in. and 11/16 in. diameters	.15
3. Rivets larger than 1¼ in. in diameter	.25
4. Lengths 1 in. and shorter	.50
5. Lengths between 1 in. and 2 in.	.25
6 Lengths over 5 in.	.25
7. Flat-head rivets	.25
8. All standard countersunk head rivets	.25
9. Swell necks	.25
10. Special heads other than our regular standards, minimum charge	.25
11. Cold or hot made solid die rivets, when specially specified.	.25
12. Annealing cold made rivets, ½ in. diameter and larger	.35
13. Small orders for miscellaneous sizes for less than two tons to parties not under contract	.10
14. Rivets packed in 100 lb. packages	.10
15. No shipments made of less than 100 lb. of one size. If customer must have small odd quantities less than 100 lb., for each keg broken to fill such quantities, 50c extra.	
16. All cone and countersunk head rivets to be charged at boiler rivet price.	
17. Cost of testing and inspection, if any, to be at customer's expense.	
18. High carbon, or special alloy rivets, special extra price upon application.	

Special Notice

Orders should specify by pounds and designate size of package wanted—if large (200 to 300 lb.) or small (100 lb.).

The Industrial Committee of the Louisville Real Estate Exchange, Louisville, Ky., organized for the purpose of taking definite steps toward bringing further manufacturing enterprises to that city, has elected E. T. Schmitt chairman; George W. Grant, vice-chairman, and S. C. Dalrymple, secretary. It is intended to confer with other business organizations of the city and effect plans for an aggressive campaign. Twenty members of the Real Estate Exchange have each subscribed $100 toward a proposed fund of $100,000 to be used in furthering the movement. In addition to advantageous transportation facilities, Louisville has cheap factory sites, cheap power and a cheap and plentiful labor supply to offer to manufacturers.

The Preston Car & Coach Company, Preston, Ont., Canada, has the contract for 35 street cars to be delivered in Edmonton, Alberta, ready for use at various times before next summer. The total cost per car will be $8350.45.

Large Gain in Pig Iron Output

October Establishes a New High Record

Fifteen More Furnaces in Blast with Production 5000 Tons a Day Greater on November 1

October is always a month in which blast furnace records are made, but last month has the distinction of establishing a new high level at 2,689,933 tons of coke and anthracite pig iron, or 86,772 tons a day, against 2,463,839 tons in September, or 82,128 tons a day. The steel works furnaces made a new high figure at 1,947,426 tons, or 62,820 tons a day. There was a net gain of 15 in active furnaces in the month, the number in blast on November 1 being 281, with a daily capacity of 88,317, against 266 with a daily capacity of 83,226 on October 1. Based on the performance of October 1, which represents special effort for high output, the furnaces running November 1 were producing pig iron at the rate of 32,600,000 tons, estimating charcoal iron at 1000 tons a day.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from October, 1911, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons.

	Steel works.	Merchant.	Total
October, 1911	50,351	17,460	67,811
November	48,430	18,218	66,648
December	46,885	19,027	65,912
January, 1912	47,844	18,540	66,384
February	53,482	18,960	72,442
March	58,961	18,630	77,591
April	61,024	18,157	79,181
May	62,018	19,033	81,051
June	60,799	20,559	81,358
July	58,168	19,570	77,738
August	59,464	21,582	81,046
September	59,102	23,026	82,128
October	62,820	23,952	86,772

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces in October and the four months preceding:

Monthly Pig Iron Production—Gross Tons.

	June. (30 days)	July. (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)
New York	176,216	167,935	167,337	161,223	179,736
New Jersey	2,773	5,309	5,935	5,693	5,370
Lehigh Valley	72,074	72,248	80,987	79,726	87,182
Schuylkill Valley	67,096	69,776	71,937	71,085	78,440
Lower Susquehanna and Lebanon Val.	50,034	58,032	59,852	65,604	61,480
Pittsburgh district	591,178	583,745	584,601	546,829	621,813
Shenango Valley	118,801	114,877	116,610	121,951	143,115
Western Penn.	138,354	135,876	145,321	142,669	157,027
Maryland, Virginia and Kentucky	42,569	40,313	43,962	42,896	42,286
Wheeling district	107,077	101,674	111,561	108,932	118,034
Mahoning Valley	229,159	234,248	252,342	243,906	256,791
Central and North Ohio	191,603	178,777	196,901	218,867	237,506
Hocking Valley, Hanging Rock and S. W. Ohio.	34,817	31,196	35,410	30,279	38,419
Chicago district	387,567	374,153	383,540	365,115	388,650
Mich., Minn., Mo., Wis., Col., Wash.	63,649	68,910	73,278	77,902	76,774
Alabama	141,422	147,409	156,115	153,374	160,834
Tenn., Georgia and Texas	26,356	26,411	26,742	27,788	36,566
Total	2,440,745	2,410,889	2,512,431	2,463,839	2,689,933

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.

	Pig. Total production			Spiegeleisen and ferromanganese.		
	1910.	1911.	1912.	1910.	1911.	1912.
January	1,773,201	1,128,448	1,483,153	19,538	8,360	22,622
February	1,620,539	1,185,782	1,550,995	21,396	12,821	15,950
March	1,739,212	1,518,063	1,827,792	25,591	11,784	11,538
April	1,669,898	1,434,142	1,830,717	22,304	10,657	11,104
May	1,619,283	1,310,378	1,922,557	26,529	13,641	20,518
June	1,549,112	1,281,241	1,823,958	27,680	22,611	26,685
July	1,462,689	1,316,646	1,803,205	22,924	17,067	26,522
August	1,442,572	1,460,610	1,843,404	25,756	14,579	24,225
September	1,410,221	1,490,898	1,773,073	15,151	17,757	22,484
October	1,419,624	1,560,884	1,947,426	8,500	19,697	27,252
November	1,242,804	1,452,907	.....	9,032	19,678	.....
December	1,113,174	1,453,446	.....	12,178	20,698	.....

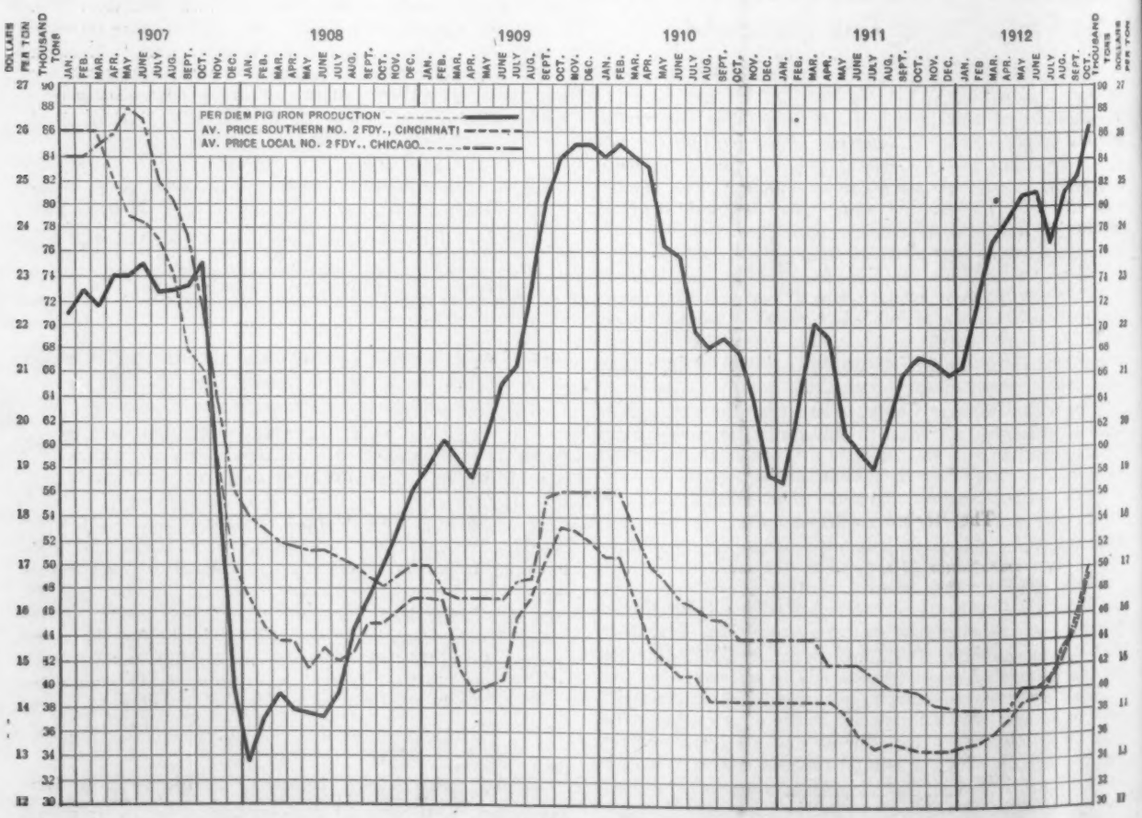


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to November 1, 1912; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Capacity in Blast November 1 and October 1

The table below shows the daily capacity of furnaces in blast November 1 and October 1:

Coke and Anthracite Furnaces in Blast.

Location of Furnaces.	Total number of stacks.	Nov. 1 Number in blast.	Nov. 1 Capacity per day.	Oct. 1 Number in blast.	Oct. 1 Capacity per day.
New York:					
Buffalo	17	16	5,350	15	5,165
Other New York	7	2	450	2	409
New Jersey	7	1	170	1	190
Pennsylvania:					
Lehigh Valley	22	13	2,826	11	2,375
Spiegel	2	2	170	2	165
Schuylkill Valley	16	9	2,530	9	2,545
Lower Susquehanna	7	5	1,165	4	910
Lebanon Valley	10	6	818	6	815
Pittsburgh District	49	47	19,954	43	18,275
Spiegel	4	4	475	4	453
Shenango Valley	20	16	4,725	14	4,350
Western Pennsylvania	27	18	5,065	18	4,810
Maryland	4	2	573	2	560
Wheeling District	14	10	3,808	10	3,631
Ohio:					
Mahoning Valley	24	20	7,980	21	8,210
Central and Northern	24	21	8,065	19	7,295
Hocking Val., Hanging Rock & S. W. Ohio	15	9	1,340	7	1,009
Illinois	32	29	12,623	28	12,045
Spiegel	2	2	204	2	140
Mich., Wis. and Minn.	10	7	1,434	7	1,470
Colorado, Mo. and Wash.	8	3	1,042	3	1,126
The South:					
Virginia	23	6	746	6	813
Kentucky	5	2	265	1	130
Alabama	46	21	5,317	21	5,215
Tennessee	20	10	1,222	10	1,120
Total	415	281	88,317	266	83,226

Among furnaces blown in last month were one Susquehanna and one Niagara in New York, Bethlehem G and Macungie in the Lehigh valley, one Shoenberger, one Edgar Thomson, one Isabella and one Aliquippa in Allegheny county, Sharpsville in the Shenango Valley, Norton in Kentucky, one Carnegie at Columbus, Ohio, one Lorain in northern Ohio, Belfont and Union in the Hanging Rock district, one South Chicago in Illinois and Hattie Ensley in Alabama.

The furnaces blown out in October or that were banked on November 1 for repairs include Lackawanna No. 3 at Buffalo, Standish in New York, Tod in the Mahoning Valley, Alabama City in Alabama.

Chart of Pig Iron Production and Prices

The fluctuations in pig iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
January	71,149	33,918	57,975	84,148	56,752	66,384
February	73,038	37,163	60,976	85,616	64,090	72,442
March	71,821	39,619	59,232	84,459	70,036	77,591
April	73,885	38,289	57,962	82,792	68,836	79,181
May	74,048	37,603	60,753	77,102	61,079	81,051
June	74,486	36,444	64,656	75,516	59,585	81,358
July	72,763	39,287	67,793	69,305	57,841	77,738
August	72,594	42,851	72,546	67,963	62,150	81,046
September	72,783	47,300	79,507	68,476	65,903	82,128
October	75,386	50,554	83,856	67,520	67,811	86,772
November	60,937	51,595	84,917	63,659	66,648	.....
December	39,815	56,158	85,022	57,349	65,912	.....

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
Jan.	2,205,607	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911
Feb.	2,045,068	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815
Mar.	2,226,457	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318
Apr.	2,216,558	1,149,602	1,738,877	2,483,763	2,064,086	2,375,436
May	2,295,505	1,165,688	1,883,330	2,390,180	1,893,456	2,512,582
June	2,234,575	1,092,131	1,930,866	2,265,478	1,787,566	2,440,745
July	2,255,660	1,218,129	3,103,431	2,148,442	1,793,068	2,410,889
Aug.	2,250,410	1,359,831	2,248,930	2,106,847	1,926,637	2,512,431
Sept.	2,183,487	1,418,998	2,385,206	2,056,275	1,977,102	2,463,839
Oct.	2,336,972	1,567,198	2,599,541	2,093,121	2,102,147	2,689,933
Nov.	1,828,125	1,577,854	2,547,508	1,909,780	1,999,433	.....
Dec.	1,234,279	1,740,912	2,635,680	1,777,817	2,043,270	.....

The plant of Gilman & Son, Springfield, Vt., manufacturers of special turning machines, was burned November 4. It is understood that they will rebuild.

Pittsburgh and Vicinity Business Notes

The axe plant at Beaver Falls, Pa., formerly owned by the American Axe & Tool Company, has been bought by John Mack and others, and it will be started up early in the new year, making a full line of axes.

The Keystone Driller Company, Beaver Falls, Pa., is erecting a one-story brick building, 60 x 360 ft., to be used as a forge and machine shop. The equipment now in the forge and machine shop will be moved into the new building and the structure vacated will be used as a boiler shop. The company is also building a two-story addition, 20 x 210 ft., to its foundry, which will be used for the storage of patterns.

The Howard Stove Company, Beaver Falls, Pa., has discarded its steam power plant and is now using electric motors entirely, purchasing current from a local power company.

The Westmoreland-Connellsville Coal & Coke Company has started the erection of 200 rectangular coke ovens at Fort Palmer, Westmoreland County, Pa. The product of these ovens will be handled by E. W. Mudge & Co., Frick Building, Pittsburgh.

The regular monthly meeting of the Pittsburgh Foundrymen's Association was held on the evening of November 4, at the Carnegie Institute of Technology. H. B. B. Yergason, of Rogers, Brown & Co., presented moving pictures illustrating the different processes in the manufacture of pig iron, which were shown at the dinner of the American Iron and Steel Institute given recently in Pittsburgh.

The Brier Hill Steel Company, Youngstown, Ohio, is building a large warehouse at Niles, Ohio, in which will be kept a complete stock of its products for shipment to customers. It is expected to be completed about the first of the year.

Elias James, for three years president of the Superior Bronze Company, and T. W. Edwards, have formed the James-Edwards Bronze Works, located at 3134 Penn avenue, Pittsburgh, and will manufacture hot and cold mill brasses, gear wheels, bushings, composition castings, aluminum castings and white metal and brass patterns.

The Phoenix Iron Works Company, Meadville, Pa., has placed a contract with the McClintic-Marshall Construction Company, Pittsburgh, for an addition to its foundry, 50 x 150 ft., with crane runway. This will about double the present capacity of the plant, making it about 50 tons of gray iron castings per day. The company recently installed a 10-ton crane and will erect a 92-in. diameter cupola.

The monthly meeting of the Engineers' Society of western Pennsylvania will be held November 19, at which F. G. Gasche, mechanical engineer of the Illinois Steel Company, will read a paper on "Theory of Steam Accumulators and Regenerative Processes." The mechanical section of the society will meet December 3, at which A. H. Helander, vice-president of the Mesta Machine Company, is expected to read a paper on "Condensing Apparatus."

The Harbison-Walker Refractories Company, Pittsburgh, manufacturer of fire brick, will soon start up its works at Lock Haven, Pa., which has been idle for several years. The present demand for fire brick is so heavy that all makers are running their works to full capacity and prices on fire brick are showing some betterment.

The Sharon Steel Hoop Company, Sharon, Pa., has placed a contract for the erection of a new office building to be of brick, 60 x 100 ft., two stories. The estimated cost is $50,000.

The Pennsylvania Engineering Works, New Castle, Pa., has received an order from the Bethlehem Steel Company, South Bethlehem, Pa., for a 1000-ton metal mixer, which it is claimed will be the largest in the United States.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, has received an order from the British Columbia Electric Company, Vancouver, B. C., for five 50-ton electric locomotives.

The Wheeling Steel & Iron Company, Wheeling, W. Va., has bought 1000 acres of coal land adjacent to its mines and workings in Fayette County, Pa., from the Wheeling Central Coal Company.

The Iron and Metal Markets

High Record Production

Remarkable October Outputs of Pig Iron and Steel Ingots

Beginning of Lake Superior Ore Buying for 1913—Pig Iron Markets Quieter

With the election over, opinion in the steel trade is just what it has been in the months in which a change of administration has been considered foregone—that the outcome will not disturb the status of any part of the enormous tonnage now on the books of producers.

October was a record-breaking month, both in production and shipments. The significant fact in it all is that a number of steel companies had more orders on their books at the end than at the beginning of the month. Some mills have reported that new contract inquiry has been smaller of late, but the Steel Corporation's statement for October 31, to be published this week, will show a further increase.

Both in pig iron and steel ingots nearly all steel companies reached new high points in output last month. The Steel Corporation's ingot production was over 1,600,000 tons, or at the rate of 60,000 tons a day.

Due to the striving for records at steel works blast furnaces, more pig iron was made in October than in any 31 days in the history of the industry. Our returns show a total of 2,689,933 tons, or 86,772 tons a day, against 2,463,839 tons, or 82,128 tons a day in September. Fifteen furnaces were added to the active list in October and the 281 furnaces in blast November 1 were producing at a daily rate of 88,317 tons, or 5000 tons a day more than on October 1.

Pig iron production is now at the remarkable rate of 32,600,000 tons a year, counting 1000 tons a day for charcoal iron. The previous high rate was 31,600,000 tons in February, 1910, at the culmination of the buying movement starting in the fall of 1909.

The ability of the furnaces to keep up long the October rate of output is questioned. Recent hard campaigns will mean stops for repairs and the maintenance of coke supply in winter months is a problem. The Steel Corporation has drawn somewhat on its 500,000-ton reserve coke pile. It is to be considered, too, that in line with the October tradition, there was a great strain for records last month.

The impression has been that railroad demand has lately been the backbone of new contract business in steel. With some companies that is the fact. It is understood, however, that the Steel Corporation traces but 16 per cent. of its new bookings in October to railroad requirements.

No fewer than 46,000 cars are reported pending. For the past week the contracts, so far as made public, were for 7000. The B. & O. rail order for 1913 has just been placed in part, but the total is not yet given out. The Norfolk & Western has bought 14,000 tons and the Nashville, Chattanooga & St. Louis 15,000 tons, both orders being placed at Ensley. The Monon has bought 5000 tons and some Mayari Bessemer rails have been closed at Chicago. The Chekiang railroad in China has taken 4000 tons of Alabama open hearth rails. A late rail inquiry is for 5500 tons for the Eastern Texas Traction Company.

Since November 1 fully 75,000 tons of plates, shapes and bars have been placed with two large companies for car construction. It is now expected that the steel fabricating contracts for 1912 will exceed those of the record year 1906, and be very considerably beyond those of 1910 and 1911. In Eastern districts 100,000 tons of steel work is definitely known that will come up for estimate in the next three months, apart from subways and elevated roads.

Steel-making pig iron has been rather more active. One steel company has bought 30,000 tons of Bessemer and 29,000 tons of basic at $17 and $16 respectively, Valley furnace. Deliveries extend over six months, beginning this month. Another has placed 24,000 tons of Bessemer and 6000 tons of basic at the above prices, for the first half of 1913. At St. Louis 15,000 tons of basic went to Southern furnaces.

Foundry iron buying has slackened, but sellers are still marking up prices, which in some districts have reached a level not likely to encourage free contracting.

Lake Superior ore prices for 1913 may be established by general selling by another week. Already reservations have been made covering a good part of the Bessemer ore production, and a smaller percentage of the non-Bessemer. Buyers expect to pay an advance of 50 cents; it may go to 75 cents, which would make the basis 25 cents less than for 1911 and 75 cents less than for 1910. October shipments were 7,010,000 tons, making a total of 43,384,000 tons, as against 42,620,000 tons by water for the entire record season of 1910.

The scrap market has eased up; in the Pittsburgh district there has been a marked slump in prices. Steel scrap in particular is weaker there, with a decline of 75 cents a ton.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	Nov. 6, 1912.	Oct. 30, 1912.	Oct. 2, 1912.	Nov. 4, 1911.
Pig Iron, Per Gross Ton:				
Foundry No. 2 X, Philadelphia.	**$18.25**	$18.00	$17.00	$15.00
Foundry No. 2, Valley furnace.	**16.75**	16.25	15.50	13.25
Foundry No. 2, Southern, Cincinnati	17.25	17.25	16.50	13.25
Foundry No. 2, Birmingham, Ala.	14.00	14.00	13.25	10.00
Foundry No. 2, furnace, Chicago*	17.50	17.50	16.50	14.50
Basic, delivered, eastern Pa.	18.00	18.00	16.50	14.50
Basic, Valley furnace	16.25	16.25	15.50	12.60
Bessemer, Pittsburgh	17.90	17.90	17.40	15.55
Malleable Bessemer, Chicago	17.50	17.50	17.00	14.50
Gray forge, Pittsburgh	16.40	16.40	15.90	13.65
Lake Superior charcoal, Chicago	18.25	18.25	17.75	16.50
Billets, etc. Per Gross Ton:				
Bessemer billets, Pittsburgh	27.00	27.00	25 00	20.00
Open hearth billets, Pittsburgh	27.50	27.50	26.00	19.00
Forging billets, Pittsburgh	34.00	34 00	32.00	25.00
Open hearth billets, Philadelphia	30.00	30 00	28.00	21.40
Wire rods, Pittsburgh	29.00	29.00	28.00	26.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	18.00	18.00	17.50	13.75
Iron rails, Philadelphia	18.00	18.00	17.00	16.50
Car wheels, Chicago	16.50	16.50	15.50	12.50
Car wheels, Philadelphia	15.00	15.00	14.25	11.75
Heavy steel scrap, Pittsburgh	*15.50*	16.25	15.00	12.25
Heavy steel scrap, Chicago	13.75	13.75	13.25	10.00
Heavy steel scrap, Philadelphia	15.50	15.50	14.50	12.00

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel, Per Pound to Largest Buyers:	Nov. 6, 1912. Cents.	Oct. 30, 1912. Cents.	Oct. 2, 1912. Cents.	Nov. 4, 1911. Cents.
Bessemer rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.67½	1.65	1.52½	1.22½
Iron bars, Pittsburgh	1.55	1.55	1.50	1.20
Iron bars, Chicago	1.50	1.50	1.50	1.20
Steel bars, Pittsburgh, future	1.40	1.40	1.35	1.15
Steel bars, Pittsburgh, prompt	1.60	1.60	1.35	1.15
Steel bars, New York, future	1.56	1.56	1.51	1.31
Steel bars, New York, prompt	1.76	1.76	1.51	1.31
Tank plates, Pittsburgh, future	1.45	1.45	1.40	1.20
Tank plates, Pittsburgh, prompt	1.60	1.60	1.40	1.20
Tank plates, New York, future	1.61	1.61	1.56	1.36
Tank plates, New York, prompt	1.76	1.76	1.56	1.36
Beams, Pittsburgh, future	1.45	1.45	1.40	1.25
Beams, Pittsburgh, prompt	1.55	1.55	1.40	1.25
Beams, New York, future	1.61	1.61	1.56	1.41
Beams, New York, prompt	1.71	1.71	1.56	1.41
Angles, Pittsburgh, future	1.45	1.45	1.40	1.25
Angles, Pittsburgh, prompt	1.61	1.61	1.56	1.41
Angles, New York, future	1.61	1.61	1.56	1.41
Angles, New York, prompt	1.71	1.71	1.56	1.41
Skelp, grooved steel, Pittsburgh	1.40	1.40	1.30	1.15
Skelp, sheared steel, Pittsburgh	1.40	1.45	1.35	1.25
Steel hoops, Pittsburgh	1.50	1.50	1.45	1.25
Sheets, Nails and Wire, Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.25	2.25	2.15	1.85
Wire nails, Pittsburgh	1.70	1.70	1.70	1.65
Cut nails, f.o.b. Eastern mills	1.75	1.75	...	...
Cut nails, Pittsburgh	1.70	1.70	1.60	1.50
Fence wire, ann'l'd, 0 to 9, P'gh.	1.50	1.50	1.50	1.45
Barb wire, galv., Pittsburgh	2.10	2.10	2.00	1.95
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt shipment	$4.00	$4.00	$2.65	$1.50
Furnace coke, future delivery	3.00	3.00	2.50	1.60
Foundry coke, prompt shipment	4.25	4.25	3.00	1.85
Foundry coke, future delivery	3.75	3.75	3.00	2.10
Metals, Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	17.50	17.75	17.87½	12.50
Electrolytic copper, New York	17.25	17.37½	17.70	12.25
Spelter, St. Louis	7.35	7.35	7.50	5.85
Spelter, New York	7.50	7.50	7.65	6.00
Lead, St. Louis	4.60	4.85	4.95	4.32½
Lead, New York	4.75	5.00	5.10	4.47½
Tin, New York	50.15	50.00	50.25	40.15
Antimony, Hallett, New York	9.75	9.75	9.37½	7.70
Tin plate, 100-lb. box, Pittsburgh	$3.60	$3.60	$3.60	$3.60

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.45c. to 1.60c. base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 1-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive fire box steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inc.	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inc.	.50
Cutting to lengths or diameters under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. and over, and zees, 3 in. and over, 1.45c. to 1.60c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in.	1.50 to 1.55
H-beams over 18 in.	1.50 to 1.55
Angles over 6 in.	1.50 to 1.55
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card, Sept. 1, 1909	1.50 to 1.55
Tees, 3 in. and up	1.50 to 1.55
Angles, channels and tees, under 3 in. plus full extras as per steel bar card, Sept. 1, 1909	1.50 to 1.55
Deck beams and bulb angles	1.75 to 1.80
Hand rail tees	2.20 to 2.30
Checkered, trough and corrugated floor plates	2.35 to 2.55

Extras for Cutting to Length.

	Cents per lb.
Under 3 ft., to 2 ft. inclusive	.25
Under 2 ft., to 1 ft. inclusive	.50
Under 1 ft.	11.55

No charge for cutting to lengths 3 ft. and over.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.60
Nos. 9 and 10	1.65
Nos. 11 and 12	1.70
Nos. 13 and 14	1.75
Nos. 15 and 16	1.80

Box Annealed Sheets, Cold Rolled.

Nos. 10 and 11	1.90
No. 12	1.90
Nos. 13 and 14	1.95
Nos. 15 and 16	2.00
Nos. 17 to 21	2.05
Nos. 22 and 24	2.10
Nos. 25 and 26	2.15
No. 27	2.20
No. 28	2.25
No. 29	2.30
No. 30	2.40

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	2.40
No. 12	2.50
Nos. 13 and 14	2.50
Nos. 15 and 16	2.65
Nos. 17 to 21	2.80
Nos 22 and 24	2.95
Nos. 25 and 26	3.10
No. 27	3.25
No. 28	3.40
No. 29	3.55
No. 30	3.70

Effective April 18, 1912, the rates for painted and formed roofing sheets, per 100 lb., are based on the following extras for painting and forming over prices for corresponding gauges in black and galvanized sheets:

Corrugated Roofing Sheets by Weight.

	29	25 to 28	19 to 24	12 to 18
Painting.				
Regular or oiling	...	0.15	0.10	0.05
Graphite, regular	...	0.25	0.15	0.10
Forming.				
2, 2½, 3 and 5 in. corrugated	0.05	0.05	0.05	0.05
2 V-crimped, without sticks	0.05	0.05	0.05	...
⅝ to 1¼ in. corrugated	0.10	0.10	0.10	...
3 V-crimped, without sticks	0.10	0.10	0.10	...
Pressed standard seam, with cleats	...	0.15	0.15	...
Plain roll roofing, with or without cleats	0.15	0.15	0.15	...
Plain brick siding	...	0.20	...	...
3-15 in. crimped	0.20	0.20	0.20	...
Weatherboard siding	...	0.25	0.25	...
Beaded ceiling	...	0.25	0.25	...
Rock face brick and stone siding	...	0.25	0.25	...
Roll and cap roofing, with caps and cleats	0.25	0.25	...	...
Roofing valley, 12 in. and wider	...	0.25	0.25	...
Ridge roll and flashing (plain or corrugated)	...	0.65	0.65	0.65

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

Steel.		*Standard Charcoal Iron.*	
1¼ to 2¼ in.	62	1½ in.	46
2½ in.	64½	1¾ to 2¼ in.	48
2¾ to 3¼ in.	69½	2½ in.	53
3½ to 4 in.	72	2¾ to 3¼ in.	55½
5 and 6 in.	64½	3½ to 5 in.	58
7 to 13 in.	62		

Locomotive and steamship special grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $29 to $29.50. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.50; galvanized, $1.90. Galvanized barb wire, to jobbers, $2.10; painted, $1.70. Wire nails to jobbers, $1.70.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.65	$1.70	$1.75	$1.80	$1.90	$2.00	$2.10	$2.20
Galvanized	2.05	2.10	2.15	2.20	2.30	2.40	2.80	2.90

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (card weight) in effect from September 10, 1912, one point greater being allowed on merchant weight; iron pipe (full weight), from October 21, 1912:

Butt Weld.

Steel. Inches.	Black.	Galv.	Iron. Inches.	Black.	Galv.
⅛, ¼ and ⅜	72	52	⅛ and ¼	67	48
½	76	66	⅜	66	47
¾ to 3	79	71	½	70	57
			¾ to 1½	73	62
			2 and 2½	73	62

Lap Weld.

2	76	68	1¼	57	46
2½ to 6	78	70	1½	68	57
7 to 12	76	66	2	69	59
13 to 15	53	..	2½ to 4	71	62
			4½ to 6	71	62
			7 to 12	69	56

Plugged and Reamed.

1 to 3, butt	77	69	1 to 1½, butt	71	60
2, lap	74	66	2, butt	72	61
2½ to 4, lap	76	68	1¼, lap	55	44
			1½, lap	66	55
			2, lap	67	57
			2½ to 4, lap	69	60

Butt Weld, extra strong, plain ends.

⅛, ¼ and ⅜	68	58	⅜	64	53
½	73	67	½	68	61
¾ to 1½	77	71	¾ to 1½	72	63
2 to 3	78	72	2 and 2½	73	64

Lap Weld, extra strong, plain ends.

2	74	66	1½	66	60
2½ to 4	76	68	2	67	59
4½ to 6	75	67	2½ to 4	71	62
7 to 8	68	58	4½ to 6	70	61
9 to 12	63	53	7 and 8	64	54
			9 to 12	59	48

Butt Weld, double extra strong, plain ends.

½	63	57	½	58	50
¾ to 1½	66	60	¾ to 1½	61	53
2 to 2½	68	62	2 to 2½	63	55

Lap Weld, double extra strong, plain ends.

2	64	58	2	56	50
2½ to 4	66	60	2½ to 4	61	55
4½ to 6	65	59	4½ to 6	60	54
7 to 8	58	48	7 to 8	53	43

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Pittsburgh

PITTSBURGH, PA., November 6, 1912.

The main features of the local iron market the past week have been the heavy purchases of Bessemer and basic pig iron by two of the leading steel companies and the sharp decline in prices of scrap. While new buying in finished iron and steel has shown a marked falling off, the pressure for deliveries on contracts is as strong as ever. Mills are getting further back on some lines and the situation, from the standpoint of deliveries, is very unsatisfactory. If the contracts now on the books of the mills are lived up to, and the material is specified for, the situation is assured up to July 1 of next year, if not longer. On an inquiry for 2000 tons of steel submitted to a local maker by a customer of long standing, the reply was that the best that could be done in delivery was July of next year, and the prospective buyer was advised to try to place the material elsewhere. The supply of cars is fairly good, and if the situation does not get any worse shippers will be well satisfied.

Pig Iron.—Purchases of basic and Bessemer pig iron have been heavy, and there is still a good deal of inquiry out. The Cambria Steel Company has bought 30,000 tons of Bessemer and 29,000 tons of basic for delivery over the next six months, shipments to begin in November. Most of the iron will come from Valley furnaces, but a part of it was bought from Corrigan, McKinney & Co., to be shipped from the furnace at Josephine, Pa. Most of the Bessemer iron was sold at $17 and the basic at $16 at Valley furnace. The Republic Iron & Steel Company has bought from the Brier Hill Steel Company 24,000 tons of Bessemer and 6000 tons of basic for delivery in first half of next year, paying $17 for the Bessemer and $16 for the basic. The market is strong. The Valley furnaces are now pretty well sold up, and have little iron to spare through the first quarter. There is a good deal of inquiry for malleable Bessemer and for foundry. The Pittsburgh Steel Company has not yet closed on its inquiry for 20,000 tons of basic for November and December, and about 15,000 tons a month for January, February and March. W. P. Snyder & Co. report that the average price of Bessemer iron in October was $17, against $15.96 in September, while the October average price of basic is given at $16.148, against $15.134 in September. These average prices are based on sales of Bessemer and basic iron of 1000 tons or over, and are at Valley furnace. We quote standard Bessemer iron at $17 to $17.25 for remainder of this year and first quarter; basic, $16.25 for this year and $16 first quarter; No. 2 foundry, $16.75 to $17; gray forge, $15.50 to $15.60; and malleable Bessemer, $16.50 to $16.75, all at Valley furnace, carrying a freight rate of 90c. a ton for delivery in the Pittsburgh district.

Billets and Sheet Bars.—The situation in steel is as tight as ever, and fancy prices are being paid by consumers who must have steel for reasonably quick shipment. Local and Youngstown steel mills have practically no steel to spare, but the smaller open hearth mills occasionally sell a few hundred tons of billets or sheet bars. One such sale of about 300 tons of open hearth billets was made last week at $28, makers' mill. For shipment at convenience of the mill we quote: Bessemer billets, $27 to $27.50; Bessemer sheet bars, $27.50 to $28; open-hearth billets, $27.50 to $28, and open-hearth sheet bars, $28 to $28.50, f.o.b. mill, Pittsburgh or Youngstown. Forging billets are $34 or higher and axle billets are about $32 to $33, Pittsburgh.

Ferromanganese.—New York importers have instructed their agents in this city to submit all inquiries before quoting prices. One local buyer was able for certain reasons to get 100 tons for first quarter at $62, Baltimore, but an offer to increase the amount to 300 tons was turned down by the seller. It is intimated strongly that prices of ferromanganese for first quarter and first half will be $70 or above. Carload lots for prompt shipment are still bringing from $74 to $75, Baltimore. The leading local consumer of ferrosilicon is reported to be in the market for about 8000 tons to cover its requirements for all of next year, and is also inquiring for 1500 to 2000 tons of ferrochromium and 1500 to 1800 tons of aluminum. We note sales of two cars, or 60 tons, of 50 per cent. ferrosilicon for prompt shipment at $75 delivered. Prices on the lower grades have advanced $1 a ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $75; over 100 tons to 600 tons, $74; over 600 tons, $73, Pittsburgh. We quote 10 per cent. at $24; 11 per cent., $25; 12 per cent., $26, f.o.b. cars at furnace, Jackson, Ohio, or Ashland, Ky. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over and 12½c. in lots up to 2000 lb.

Steel Rails.—The Pittsburgh & Lake Erie Railroad has placed an order with the Carnegie Steel Company for about 12,000 tons of standard section rails for delivery early next year. The new demand for light rails continues very active, and the Carnegie Steel Company is now about two months behind in shipments. This company received new orders and specifications against contracts for over 5000 tons of light rails in the past week. An advance in light rails in the near future is likely on account of the crowded condition of the mills. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45-lb. sections, 1.25c.; 16 and 20-lb., 1.30c.; 12 and 14-lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Wire Rods.—An inquiry for 1500 tons of either Bessemer or open-hearth rods is reported, but none of the local mills is in position to make deliveries wanted. The available supply is very light, most producers needing their entire output for their own wire mills. Prices are strong. We quote Bessemer, open-hearth and chain rods at $29 to $29.50, Pittsburgh.

Muck Bar.—There is a good deal of new inquiry, but local muck bar mills have little to spare. Some Eastern muck bar is finding its way into this market and is being sold at slightly lower prices than for domestic. We quote best grades, made from all pig iron, from $32.50 to $33, Pittsburgh.

Skelp.—Prices are very strong, and new demand is active. A local mill is reported to have bought 5000 to 6000 tons of grooved iron skelp recently for which it paid about 1.65c., delivered. We quote grooved steel skelp at 1.40c. to 1.45c.; sheared steel skelp, 1.45c. to 1.50c.; grooved iron skelp, 1.65c. to 1.70c., and sheared iron skelp, 1.75c. to 1.80c., delivered at buyer's mill in Pittsburgh district.

Plates.—Few orders for steel cars were placed in the past week, but inquiry is active. The Pittsburgh & Lake Erie has bought 2000 to 3000 steel hopper cars, the order being divided between the Pressed and the Standard steel car companies. Active inquiries in the market include 3000 hopper, gondola and box cars for the Chesapeake & Ohio; 1000 box, 500 gondola and 500 hoppers for the Delaware, Lackawanna & Western; 500 hoppers, 300 box, 50 stock and 100 flat cars for the New York, Ontario & Western; 800 box and 100 gondolas for the New York & Norfolk; 2000 gondolas for the Missouri Pacific; 2000 gondolas for the Detroit, Toledo & Western; 2000 box cars for the Missouri, Kansas & Texas; 2000 box cars for the Missouri Pacific; 500 box cars for the San Antonio & Aransas Pass; 100 hopper and 100 gondolas for the Pittsburgh-Westmoreland Coal Company. The Carnegie Steel Company has taken an order for 5000 to 6000 tons of plates and shapes for a new boat to be built for W. R. Grace & Co. for the South American trade by the William Cramp & Sons Ship & Engine Building Company, and has also taken an order for about 5000 tons of plates from the Riter-Conley Mfg. Company for the Los Angeles aqueduct. Local car companies are filled up for the remainder of this year but are not able to get out maximum output on account of slow deliveries of plates by the mills. The two leading local plate mills are not taking any new orders for delivery before second quarter, but some of the smaller mills will take orders for delivery within four to six weeks for which they readily obtain premiums of $2 to $4 a ton over regular prices. We quote ¼-in. and heavier tank plate at 1.45c. to 1.50c., Pittsburgh, for delivery in first and second quarters, while for shipment within two or four weeks from date of order, 1.60c. to 1.70c. is being paid.

Structural Material.—New inquiry has been light. The McClintic-Marshall Construction Company has taken 2000 tons for a steel building for the Forged Steel Wheel Company, Butler, Pa., and the Fort Pitt Bridge Works has taken about 2000 tons for viaduct work in the East. The American Bridge Company has taken about 12,000 tons of bridge work and steel buildings for Western delivery. Local fabricators being well filled up for the next four to six months, they are not anxious for new orders. The market is strong. We quote beams and channels up to 15 in. at 1.45c., for delivery at convenience of the mills, and this would probably be in second quarter of next year, while for reasonably prompt shipment small lots are being sold at 1.60c. to 1.80c., Pittsburgh.

Car Wheels.—The Carnegie Steel Company has taken an order for 2000 car wheels for freight service for the Chicago & Northwestern Railroad and 3000 for the Norfolk & Western, the latter to be used in equipping freight cars to be built by the road in its own shops at Roanoke, Va. We quote 36-in. steel wheels for passenger service at $18.50 and 33-in. for freight service at $14.50 per wheel, f.o.b. Pittsburgh.

Iron and Steel Bars.—The new demand for both iron and steel bars is fairly heavy, but has not been so active, due to the fact that most large consumers have covered their wants for some time ahead. A feature of the bar iron market at present is that a number of mills in the West, that have been inactive for a long time, are being started up to meet the heavy demand. Mills report that specifications against contracts are coming in as freely as ever and none of them is catching up on deliveries to any extent, while all will carry over into next year a very heavy tonnage that should have been delivered this year. Specifications for iron and steel bars from the car builders are particularly heavy. The demand for hard steel bars for reinforcing purposes continues strong, the consumption of this material this year having been much larger than in any previous year. We quote steel bars at 1.40c. to 1.45c. for delivery at convenience of the mills, which would be in first or second quarter of next year, while for delivery over the remainder of this year from 1.60c. to 1.75c. is being freely paid. We quote common iron bars at 1.55c. to 1.60c. at mill, premium of $2 to $3 still being paid for prompt shipments. Makers of steel bars quote $1 extra per ton for twisting bars, ¾-in. and larger, and $2 extra per ton for ½ to ⅝-in.

Sheets.—Several of the largest makers report that October was a record month in every way. The new demand for sheets continues active, and specifications are still coming in at an unprecedented rate, so that the mills instead of catching up on deliveries are getting further behind. Several mills have their output from now through first quarter practically sold up, and premiums are being paid over regular prices for shipment within three to four weeks from date of order. The market is very firm on the basis, minimum, of 1.65c. for Nos. 9 and 10 blue annealed sheets; 2.25c. for No. 28 black and 3.40c. for No. 28 galvanized, in carload and larger lots f.o.b. mill Pittsburgh, jobbers charging the usual advances over these prices for small lots from stock.

Tin Plate.—Large consumers are contracting freely for their supply through first quarter and first half. New specifications and new orders for this year have been light for some time and the mills are pretty well caught up on such shipments. The mills will likely run fairly full for the remainder of this year, and it is very certain that the output for 1912 will be much the heaviest of any one year in the history of the tin plate trade. We quote $3.60 per base box for 14 x 20 coke plates for delivery over first quarter and first half of next year, and this price has been quite well observed in the placing of large contracts.

Hoops and Bands.—Not much new buying is being done in either hoops or bands, as consumers have covered their wants for a considerable time ahead. We quote steel bands at 1.40c. to 1.45c., with extras as per the steel bar card, and hoops at 1.50c., Pittsburgh, for shipment through first quarter.

Bolts and Rivets.—The new demand, while heavy, has recenly shown a slight falling off, as consumers have covered their wants pretty well through first quarter. All makers have their output for the next three or four months pretty well sold up. We quote button head structure rivets at $2 and cone head boiler rivets at $2.10 per 100 lb., base, in carloads, an advance of 25c. being charged for small lots. For first quarter shipment makers are asking $2.25 for structural rivets and $2.35 for boiler rivets. The new discounts on bolts are as follows, in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coach and lag screws	80 and 10% off
Small carriage bolts, cut threads	75 and 7½% off
Small carriage bolts, rolled threads	75, 10 and 2½% off
Large carriage bolts	70 and 5% off
Small machine bolts, rolled threads	75, 10 and 7½% off
Small machine bolts, cut threads	75, 10 and 2½% off
Large machine bolts	70 and 10% off
Machine bolts with C.P.C. and T nuts, small	75 and 7½% off
Machine bolts with C.P.C. and T nuts, large	70 and 2½% off
Square hot pressed nuts, blanked and tapped	$5.80 off list
Hexagon nuts	$6.40 off list
C.P.C. and R. square nuts, tapped and blank	$5.80 off list
Hexagon nuts ⅝ and larger	$6.70 off list
Hexagon nuts smaller than ⅝	$7.30 off list
C.P. plain square nuts	$5.30 off list
C.P. plain hexagon nuts	$5.60 off list
Semi-finished hexagon nuts ⅝ and larger	85 and 5% off
Semi-finished hexagon nuts smaller than ⅝	85, 10 and 5% off
Small rivets	80 and 5% off

Spelter.—The demand has quieted down and prices have been more or less erratic. Sellers claim to be firm at 7.35c., East St. Louis, but consumers state that they can place orders readily at 7.25c., if they should care to contract.

Railroad Spikes.—There is still a great scarcity in the supply of small railroad spikes, several makers stating they have their output sold up to April 1. Specifications from railroads are coming in very freely. From the amount of new rail buying already done by the railroads, it is evident that the consumption of spikes in 1913 is going to be very heavy. We quote railroad spikes in base sizes, 5½ x 9-16 in., at $1.80 to $1.85, and small railroad and boat spikes to $1.90 per 100 lb., f.o.b. Pittsburgh, for delivery through first quarter.

Wire Products.—The new demand for wire and wire nails continues heavy, and all the mills are more or less back in shipments. The Page Woven Wire Fence Company, Monessen, Pa., states that premiums of about 10c. per keg on wire nails and $1 to $2 a ton on wire are being paid for reasonably prompt shipments. Two of the leading wire nail makers are still quoting $1.75 for wire nails, but admit that they are not getting much new business. We quote wire nails at $1.70 to $1.75 per keg; cut nails, $1.70 per keg; galvanized barb wire, $2.10 per 100 lb.; painted, $1.70; annealed fence wire, $1.50, and galvanized fence wire, $1.90, f.o.b. Pittsburgh, usual terms, freight added to point of shipment. Jobbers charge the usual advances for small lots from store.

Merchant Steel.—The new demand is not quite so heavy as it was several weeks ago, due to the fact that consumers have covered their needs over the next three or four months. Shipments by the mills in October are reported to have been the heaviest in any one month this year. Prices are firm and we quote: Iron

finished tire, 1½ x ⅜-in. and larger, 1.40c. base; under 1½ x ⅜-in., 1.55c.; planished tire, 1.60c.; channel tire, ¾, ⅞ and 1 in., 1.90c.; 1⅛ in. and larger, 1.80c.; toe calk, 2c. base; flat sleigh shoe, 1.50c.; concave and convex, 1.80c.; cutter shoes, tapered or bent, 2.40c. to 2.45c.; spring steel, 2c.; machinery steel, smooth finish, 1.80c. to 1.85c., all f.o.b. at mill, Pittsburgh.

Shafting.—As most consumers, including the implement makers and the automobile builders, have covered their requirements for a considerable time ahead, the new demand is only fairly active. We quote cold-rolled shafting at 60 per cent. off in carload and larger lots and 55 per cent. in small lots, delivered in base territory.

Merchant Pipe.—An inquiry is in the market for about 15 miles of 6-in. steel pipe for a western gas company, and an order has been placed with an Ohio mill for 10 miles of 6-in. steel pipe. A good many gas and oil projects that probably would have gone through this year have been held over until 1913 on account of the crowded condition of the pipe mills and the higher prices ruling. The mills will carry over a very large amount of pipe business into next year that should have been cleaned up this year. The new demand is quieting down to some extent, due to the approaching winter when a good deal of outdoor work will stop, and also to the fact that jobbers are pretty well bought ahead. It is stated that discounts on both iron and steel pipe are being fairly well maintained.

Boiler Tubes.—The heavy buying for this year is pretty well over, but the mills have enough orders on their books to take their entire output into first quarter of next year. Discounts on steel and iron tubes are reported as being firmly held.

Iron and Steel Scrap.—A slump in prices has come, but whether it is only temporary or will continue for some time is a question. All the leading consumers are loaded with material, and while they are taking in scrap freely and are using it, the supply is in excess of the demand. Heavy steel scrap is particularly weak, having declined fully 75c. a ton. Other grades have gone off 50c. a ton or more. For the first time in some months, dealers are trying to force sales. In some quarters it is believed that the decline will be short lived and that prices will soon show an upward tendency. We do not hear of any large sales. Dealers now quote, per gross ton, as follows:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	$15.50
No. 1 foundry cast	$14.75 to 15.00
No. 2 foundry cast	13.50 to 13.75
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	13.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.75 to 17.00
No. 1 railroad malleable stock	14.00 to 14.25
Grate bars	11.00 to 11.25
Low phosphorus melting stock	18.25 to 18.50
Iron car axles	26.00 to 26.25
Steel car axles	18.00 to 18.25
Locomotive axles, steel	22.00 to 22.25
Locomotive axles, iron	28.00 to 28.25
No. 1 busheling scrap	14.50 to 14.75
No. 2 busheling scrap	10.00 to 10.25
Old car wheels	16.00 to 16.25
*Cast-iron borings	10.25 to 10.50
*Machine shop turnings	11.00 to 11.25
†Sheet bar crop ends	16.75 to 17.00
Old iron rails	16.50 to 16.75
No. 1 R. R. wrought scrap	15.25 to 15.50
Heavy steel axle turnings	13.00 to 13.25
Stove plate	11.00 to 11.25

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Coke.—The deadlock between furnace operators and coke makers over prices on furnace coke for delivery next year is still on, and the local coke market as regards sales is quiet. Prices remain firm on furnace coke for prompt shipment, and we note sales of 8000 to 10,000 tons of standard Connellsville furnace coke at $3.85 to $4 per net ton at oven. Some makers are holding for $3.25 to $3.50 for first half, and firmly believe they will soon be able to get these prices, claiming that there will not be enough coke to go round in the winter months. The demand for foundry coke for prompt shipment is quiet, and there is not much doing in the placing of contracts for delivery next year. We quote furnace coke for prompt shipment at $3.85 to $4 and on contracts for first half of next year at $3 to $3.50, some makers holding out for the higher figure. We quote standard makes of prompt 72-hr. foundry coke for prompt shipment at $3.75 to $4, while on contracts from $3.50 to $4.25 are being quoted. The output of coke in the Upper and Lower Connellsville regions last week was about 396,000 net tons, a slight decrease over the previous week.

Chicago

CHICAGO, ILL., November 5, 1912.

In some lines October was a record breaking month. General specifications for plates, shapes, bars, rails and track supplies are in large volume. Car orders are a strong feature. The pig iron market has ruled rather quiet, but there is a general expectancy of a number of large inquiries as soon as the uncertainty incident to the election has passed. Reports of car shortage grow more frequent, and a serious phase of the situation is the inability of some manufacturers to obtain a sufficient quantity of coal. The scrap market is still weak, some items showing a decline of 25c. a ton.

Pig Iron.—Inquiries have been small, both as to numbers and tonnages. The quietness is ascribed to the hesitancy of consumers in placing business until after the results of the national election are known. Few, if any, open inquiries were in the market, but some quiet buying was done in small lots and there was the usual amount of feeling out the situation with regard to the first half of 1913. Local iron is very firm. A small sale of Southern No. 2 iron for spot shipment was made last week at $14.50, Birmingham, a premium of 50c. a ton. A St. Louis steel foundry, which was in the market for 25,000 tons of basic, is reported to have bought 6000 tons from a Southern furnace for first quarter delivery and 9000 tons from the same source for second quarter delivery at two different prices. Many large consumers have not satisfied their total requirements for the first quarter of 1913, and a number of large inquiries are expected from them after the excitement incident to the national election is over. The coke situation is unimproved. The ruling price for this territory is $4 a ton at oven, but a spot shipment of three carloads the past week brought $4.10, without demur from the buyer. We quote local irons, f.o.b. furnace, the average switching charge to Chicago foundries being about 50c. a ton. Other quotations are for Chicago delivery. Prices on prompt shipment are as follows:

Lake Superior charcoal, No. 1, 2, 3, 4	$18.25 to $19.25
Northern coke foundry, No. 1	18.00
Northern coke foundry, No. 2	17.50
Northern coke foundry, No. 3	17.00
Northern Scotch, No. 1	18.00
Southern coke, No. 1 foundry and No. 1 soft	18.85 to 19.35
Southern coke, No. 2 foundry and No. 2 soft	18.35 to 18.85
Southern coke, No. 3	17.85 to 18.35
Southern coke, No. 4	17.35 to 17.85
Southern gray forge	16.85
Southern mottled	16.85
Malleable Bessemer	17.50
Standard Bessemer	19.40
Basic	17.50
Jackson Co. and Kentucky silvery, 6 per cent	20.40
Jackson Co. and Kentucky silvery, 8 per cent	21.40
Jackson Co. and Kentuckky silvery, 10 per cent	22.40

Rails and Track Supplies.—Although comparatively little actual business in rails was placed the past week, negotiations are in progress that will culminate in contracts soon. Specifications for track supplies are far in excess of the output of the mills. Standard railroad spikes have been advanced $1 a ton; track bolts and tie plates are quoted $2 a ton higher. We quote standard railroad spikes at 1.95c. to 2.05c., base; track bolts with square nuts, 2.30c. to 2.40c., base, all in carload lots, Chicago; tie plates, $32 to $34.50 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Railroads are continuing to place large orders for cars in this market. The Pennsylvania Lines West closed negotiations last Friday for 3500. The Missouri Pacific is in the market for 2000 box cars and 2000 gondolas. Car orders placed now cannot be executed until the last half of 1913. Contracts for fabricated material placed the past week include 1796 tons for a steel highway bridge at Shreveport, La., to the Modern Steel Structural Company; 171 tons for a power station to be built by the Licking Light & Power Company, Newark, Ohio, to the Riverside Bridge Company; 4215 tons for various bridges to be constructed by the Northern Pacific Railroad, to the Fort Pitt Bridge Works; 4784 tons for Missouri River and Yellowstone River bridges, to be built by the Great Northern, and 1600 tons for various bridges to be built by the Northern Pacific, to the American Bridge Company. We quote for Chicago delivery, mill shipment, plain shapes, 1.63c. to 1.83c.

Jobbers are having difficulty in keeping up stock, and are obliged to pay premiums for prompt deliveries to meet the demand of customers for shapes out of store. We quote for base sizes, 2.05c.

Plates.—The demand is in excess of the rate of production. Railroads are buying locomotives freely. The

Chicago & Northwestern is reported as having ordered 130 locomotives. Prompt deliveries command a premium as high as 1.70c. and even on some contract business 1.50c., Pittsburgh, is asked. We quote for Chicago delivery, mill shipment, 1.63c. to 1.83c.

The demand for plates from store continues without abatement. Jobbers are obliged to buy at premium prices to get prompt shipments and keep stocks assorted. We quote for delivery from store, 2.05c., base.

Sheets.—Some of the larger interests are practically out of the market for the remainder of the year, accepting only such business as cannot conveniently be given a later delivery. For black sheets 2.53c. continues as the minimum base price, while 3.68c. is the ruling quotation for galvanized, both Chicago. Blue annealed sheets can be delivered with less delay and are quoted at 1.83c., Chicago base. We quote for Chicago delivery, in carloads from mill: No. 28 black sheets, 2.53c.; No. 28 galvanized, 3.68c., and No. 10 blue annealed, 1.83c. to 1.88c.

No shrinkage is noted in the volume of business done by jobbers. As the mill situation becomes more serious with respect to deliveries, buyers are obliged to satisfy their requirements from store. We quote on prices from jobbers' stocks as follows: No. 10 blue annealed, 2.25c.; No. 28 black, 2.80c., and No. 28 galvanized, 4.05c.

Bars.—One prominent manufacturer reports that specifications in the month just closed were the largest for any corresponding period in five years. Implement specifications were the heaviest, and demand from this source continues strong. The mills are badly sold up and are unable to make deliveries in much less than two months, and more often the time required is longer than this, frequently as great as four months. This situation has brought shipping instructions into this market from 30 to 60 days earlier than usual to insure delivery at the proper time. Premium prices as high as 1.70c. to 1.75c. are paid for reasonably prompt delivery of steel bars, while the contract price remains at 1.40c. Pittsburgh. We quote for mill shipment as follows: Bar iron, 1.50c. to 1.55c.; soft steel bars, 1.58c. to 1.65c.; hard steel bars, 1.60c. to 1.70c.; shafting in carloads, 60 per cent. off; less than carloads, 55 per cent. off.

Business in bars from store is very active. Jobbers can sell very readily all the bars they are able to get. For delivery from store, we quote soft steel bars, 1.95c.; bar iron, 1.95c.; reinforcing bars, 1.95c. base with 5c. extra for twisting in sizes ¾ in. and over, and 7½c. extra for smaller sizes; shafting 55 per cent. off.

Rivets and Bolts.—Deliveries can as a rule be made in from two to four weeks. Structural bolts have advanced $2 a ton. We now quote 2.08c. to 2.18c., though some makers have established their minimum price as 2.18c. We quote from mill as follows: Carriage bolts up to ⅜ in. x 6 in., rolled thread, 75-10-2½; cut thread, 75-7½; larger sizes, 70-5; machine bolts up to ⅜ in. x 4 in., rolled thread, 75-10-7½; cut thread, 75-10-2½; large sizes, 70-10; coach screws, 80-10; hot pressed nuts, square head, $5.80 off per cwt.; hexagon, $6.40 off per cwt. Structural rivets, ¾ to 1¼ in., 2.08c. to 2.18c.; base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to ¾ x 4 in., 70-12½; larger sizes, 65-10; carriage bolts up to ¾ x 6 in., 70-10; larger sizes, 65-5 off. Hot preseed nuts, $5.40, and hexagon, $6 off per cwt.

Wire Products.—Demand for wire products continues very strong. Woven wire fencing fabricators are working mills day and night and are large consumers of wire. Farmers are building fences and consequently the consumptive demand for barb wire and plain wire and fabricated fencing is exceptionally good. Ideal weather for building construction has prevailed to the advantage of the wire nail trade. We quote plain wire, No. 9 and coarser, base, $1.68 to $1.73; wire nails, $1.88 to $1.93; painted barb wire, $1.88 to $1.93; galvanized, $2.28 to $2.33; polished staples, $1.88 to $1.93; galvanized, $2.28 to $2.33, all Chicago.

Cast Iron Pipe.—Routine business in cast iron pipe is good. Aside from one letting of 2000 tons by Kansas City, Mo., this week, there have been no large orders placed. With cold weather approaching, municipalities have ceased to be a factor in the market. We note that the city of San Francisco will extend its water system; also that the city of Pasadena, Cal., has sold the last of a $1,250,000 bond issue, the proceeds from which will be used for water works construction, and Longview, Texas, has appropriated $100,000 for a water works system. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $30; 6 to 12 in., $28; 16 in. and up, $27, with $1 extra for gas pipe.

Old Materials.—The local scrap iron market continues weak. The slump which occurred more than a week ago has been accentuated by the disposition of consumers not to buy under existing conditions. Most of the mills and foundries have a three or four months' supply on hand and are staying out of the market for the present. Dealers find themselves overloaded, and when they can find a buyer are willing to shade prices to move a part of their holdings. We quote Nos. 1 and 2 railroad wrought, Nos. 1 and 2 busheling, No. 1 cast scrap and other items 25c. a ton lower than a week ago. The Santa Fé Railroad is offering 6500 tons of assorted old material; the Pennsylvania Lines West have about 2000 tons and the St. Louis & San Francisco has issued a small list aggregating 500 tons. We quote for delivery at buyer's works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	$18.00 to $18.50
Old steel rails, rerolling	16.25 to 16.75
Old steel rails, less than 3 ft.	14.50 to 15.00
Relaying rails, standard section, subject to inspection	24.00
Old car wheels	16.50 to 17.00
Heavy melting steel scrap	13.75 to 14.25
Frogs, switches and guards, cut apart	13.75 to 14.25
Shoveling steel	13.50 to 14.00
Steel axle turnings	11.00 to 11.50

Per Net Ton.

Iron angles and splice bars	$16.50 to $17.00
Iron arch bars and transoms	17.25 to 17.75
Steel angle bars	13.00 to 13.50
Iron car axles	21.75 to 22.25
Steel car axles	17.75 to 18.25
No. 1 railroad wrought	13.50 to 14.00
No. 2 railroad wrought	12.50 to 13.00
Cut forge	12.50 to 13.00
Steel knuckles and couplers	12.50 to 13.00
Steel springs	13.25 to 13.75
Locomotive tires, smooth	14.00 to 14.50
Machine shop turnings	8.75 to 9.25
Cast and mixed borings	7.50 to 8.00
No. 1 busheling	11.75 to 12.25
No. 2 busheling	8.75 to 9.25
No. 1 boilers, cut to sheets and rings	9.75 to 10.25
Boiler punchings	12.75 to 13.25
No. 1 cast scrap	13.50 to 14.00
Stove plate and light cast scrap	11.25 to 11.75
Railroad malleable	13.75 to 14.25
Agricultural malleable	11.75 to 12.25
Pipes and flues	10.75 to 11.25

Philadelphia

PHILADELPHIA, PA., November 5, 1912.

The market in all branches continues strong. Large consumers are still making efforts to cover for requirements well in advance, and in some lines producers are unable to promise deliveries inside of six or eight months. In pig iron, heavy transactions in forge have been the feature, but foundry grades have also been fairly active. The coke and labor situation still restrains the blowing in of idle blast furnaces. Steel rolling billets have been sold at $32, delivered, for first quarter shipment. In many instances new records were established in October, both as to orders for finished material entered and deliveries made. Coke continues firm and has been fairly active. The old material market has been quiet, with prices practically unchanged.

Iron Ore.—Sales of some 35,000 tons of Wabana ore for 1913 delivery have been made at 7¼c. per unit. Sales of this ore for next year's shipment to consumers in this district now total close 225,000 tons. Sales of 45,000 tons of Wabana ore to Germany are also reported and at the highest prices ever obtained for this ore in that country, the basis being relatively higher than has been paid here. Negotiations are pending for considerable tonnages of other ores, both foreign and domestic, although practically nothing is being done in European ores.

Pig Iron.—The market continues decidedly strong with an upward tendency in prices still in evidence. While transactions in the higher foundry grades have been unimportant, prices have hardened, the recent minimum for standard brands of eastern Pennsylvania No. 2X foundry of $18 delivered being no longer available, $18.25 now being the bottom of the market. Few makers have any quantity for early shipment and are still hesitating when it comes to entering large orders for extended delivery. Virginia furnaces are maintaining prices firmly; sales of No. 2 X foundry at $16, furnace, are being made in moderate lots for near future and first quarter delivery, although some makers, being sold up for the remainder of the year, name prohibitive prices for such delivery. A moderate lot of second quarter Virginia No. 2 X has been sold at $15.50, furnace. Cast iron pipe makers have been making further inquiries for low grade iron, although little definite business is pending. An option on 15,000 tons, which was recently asked by one pipe maker in this district, is reported as having been canceled. Considerable business

in rolling mill forge iron has recently developed. Sales involving two 5000-ton lots, delivery over the remainder of this and first quarter of next year, have been made at $17.50 to $17.75, delivered Schuylkill Valley points. Additional business aggregating several thousand tons is pending. Several sales of basic iron, in which conversion deals were involved, have been put through; one covered 3000 tons, on which the price is based at about $18.15, and another 1500 tons, on which the price was based at $18.50, delivered. A sale of several thousand tons of basic, taken against an old option, on which the price was just under $18, delivered, is also reported. A number of producers continue to maintain quotations firmly at $18.50, delivered here, for standard basic. Sales of standard analysis low phosphorus iron, aggregating over 12,000 tons, for delivery during varying portions of next year, have been closed at prices ranging from $23.50 to $24, delivered in this district. This grade is now very strong at $24. The following range of prices is named for delivery in buyers' yards in this district, for shipment extending over the remainder of the year and first quarter of 1913:

Eastern Pennsylvania No. 2 X foundry	$18.25 to $18.50
Eastern Pennsylvania No. 2 plain	18.00 to 18.25
Virginia No. 2 X foundry	18.80 to 19.00
Virginia No. 2 plain	18.55 to 18.75
Gray forge	17.50 to 17.75
Basic	18.00 to 18.50
Standard low phosphorus	23.50 to 24.00

Ferroalloys.—The movement in ferromanganese has been comparatively light. Quotations are still being made for the last half of next year's delivery at $61, seaboard, although a wide variety of prices governs for earlier delivery. A sale of a small lot for November shipment, at $72 seaboard, is reported. No sales of importance have been reported in ferrosilicon, and prices are unchanged.

Billets.—There has been little diminution in the demand for forward rolling and forging billets. The leading producer in this district is well sold up and has advanced prices and made sales of basic open-hearth rolling billets for first quarter shipment at $32, delivered here. Ordinary analysis forging billets bring $34 at mill, and as high as $40 has been paid, dependent on specifications and customer. Standard billets for prompt delivery are scarce and command fancy prices. Southern billets have, however, been sold in small lots at prices equal to about $30, delivered.

Plates.—Several of the Eastern mills made new production records in October, yet are steadily going behind on deliveries. Eight to ten weeks is now considered very prompt delivery by the majority of the mills and the amount available for such delivery is limited. Mills are closely scanning inquiries and are further restricting the acceptance of forward business. Orders are coming in freely from all classes of consumers and some heavy business is pending in boat, boiler and bridge plates. Prices are very firm at 1.75c. to 1.78c. for sheared and 1.80c. to 1.83c. for universal plates, delivered in this district.

Structural Material.—Eastern mills are so well fixed with orders and specifications that little effort is being made to enter new contracts. Deliveries named against some inquiries are almost prohibitive. Shipments on contracts are, if anything further delayed. Several Eastern producers are almost unable to enter business for early shipment even though premiums are offered. A very fair volume of miscellaneous business continues to come out, although developments in the way of large building propositions have been meager. Plain structural shapes are very firm at 1.75c., for reasonable delivery in this district, although lower prices are named for uncertain extended shipment by some producers.

Sheets.—A continued active demand is reported, with premiums of $4 to $6 a ton being offered Eastern mills for prompt shipments in some grades of material. Daily orders continue, as a rule, to exceed mill capacities. Western sheets for early delivery are scarce. Prices are very strong but unchanged at 1.80c., delivered here, for Western No. 10 blue annealed, although Eastern mills making smooth, loose-rolled sheets readily obtain ¼ to ½c. per lb. advance over that basis.

Bars.—A very active demand, particularly for early delivery, is noted. Soft steel bars for early shipment have been sold at 1.85c., delivered here, although forward bars are quoted around 1.60c. Makers of iron bars have in practically all cases advanced puddlers' wages from $4.50 to $4.75 a ton, and are so well sold ahead that fancy prices are asked and obtained for prompt shipments. Common iron bars are quoted at 1.60c. mill, minimum, for ordinary delivery, and as high as 1.75c. has been paid for prompt shipment. For ordinary delivery in this district prices range from 1.67½c. to 1.72½c.

Coke.—Several contracts for furnace coke for first half are noted, including one involving 4000 tons per month over the first half of next year, at $2.75 at oven. For prompt shipment furnace coke commands from $3.85 to $4 at oven, although non-standard grade was sold in one instance at $3.60. Higher prices are being obtained for foundry coke; sales have been made at $4, $4.15 and $4.25 at oven, for prompt shipment, although $3.75 can be done for contract foundry coke of some grades. Prices show a rather extended range, depending on available supply. The following quotations, per net ton, about represent the market for deliveries in buyers' yards in this district:

Connellsville furnace coke	$5.00 to $6.25
Connellsville foundry coke	6.00 to 6.50
Mountain furnace coke	4.50 to 5.85
Mountain foundry coke	5.60 to 6.10

Old Material.—The market has been comparatively quiet. Dealers are not forcing business, and consumers being comparatively well supplied are taking on only odd cheap lots. Rumors of sales of No. 1 heavy melting steel scrap at high prices have not been confirmed. Producers in several instances have been buying small lots at $15.50, delivered. Rolling mill grades have not been very active. Low phosphorus scrap is scarce and being held at higher prices. Prices, on the whole, are firm, the following range about representing the market for deliveries in buyers' yards, eastern Pennsylvania and nearby points, taking a freight rate ranging from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel scrap and crops	$15.50 to $16.00
Old steel rails, rerolling (nominal)	17.00 to 17.50
Low phosphorus heavy melting steel scrap	19.25 to 19.75
Old steel axles	19.00 to 19.50
Old iron axles	25.00 to 26.00
Old iron rails (nominal)	18.00 to 18.50
Old car wheels	15.00 to 15.50
No. 1 railroad wrought	17.00 to 17.50
Wrought iron pipe	14.00 to 14.50
No. 1 forge fire	13.50 to 14.00
No. 2 light iron (nominal)	8.00 to 8.50
Wrought turnings	11.50 to 12.00
Cast borings	11.00 to 11.50
Machinery cast	14.75 to 15.25
Grate bars, railroad	11.50 to 12.00
Stove plate	11.50 to 12.00
Railroad malleable (nominal)	13.00 to 13.50

Cleveland

CLEVELAND, OHIO, November 5, 1912.

Iron Ore.—October shipments were 7,010,219 gross tons, making the total movement up to November 43,384,601 tons, as compared with 42,620,206 tons moved by water in the entire season of the record breaking year of 1910. October was the fifth month of the year in which shipments exceeded 7,000,000 tons. In November, 1909, Lake shipments amounting to 4,899,220 tons and it is very probable that the movement of the present month will equal that of the corresponding month three years ago, making the total Lake shipment for the season over 48,000,000 tons. Ore shipments are still quite heavy but some mining companies are fast cleaning up, and shipments will fall off considerably after the middle of the month. In view of the present condition of the steel industry and the probability of a very heavy demand for ore for next year's delivery, shippers expect that the 50,000,000 ton mark will be reached in 1913. There has been a heavy reservation of 1913 ore the past week, mostly in Bessemer grades. Some actual sales have also been booked at prices to be fixed later. It is believed that the bulk of the Bessemer ore will be reserved before the end of the week. There have also been some reservations of non-Bessemer grades. While an early buying movement had been looked for the activity of consumers in making reservations has been a surprise to the sellers, who hoped that they could hold buyers off until the present shipping season was over. Although no prices have as yet been named it is possible that 1913 prices may be established within a week. Furnacemen are willing to pay an advance of 50c. a ton and that much of an advance has already been discounted. Sentiment among sellers appears to favor an advance ranging from 50c. to 75c. Developments in the pig iron market as regards prices are being watched closely and are likely to have an effect in determining ore prices. A 50c. advance would be 25c. less than the 1911 prices and 75c. less than the 1910 prices. There is again some talk of reducing the basis of iron content from 51.50 per cent. to 50.50 per cent., but it does not seem probable that the basis will be changed. We quote prices for this season as follows: Old range Bessemer, $3.75; Mesaba Bessemer, $3.50; old range non-Bessemer, $3.05; Mesaba non-Bessemer, $2.85.

Pig Iron.—The market is not active but prices are very firm. Local quotations on foundry grades have been advanced 25c., and $17, furnace, is now the minimum quotation for No. 2 foundry for local delivery or outside shipment. One local producer has advanced its price to $17.50. In the Valley the market appears well established and very firm at $17. Some Valley sellers are now quoting $17.50 for No. 2. We note the sale of two 1000-ton lots of foundry iron for the first half, one lot going to a northern Ohio consumer at $17, furnace. A number of other sales of smaller tonnages are reported. The heavy foundry melt has compelled some consumers to come in the market for additional quantities for early delivery, and there are inquiries from these sources for iron for November and December shipment. Consumers are urging deliveries, which are being delayed somewhat by the car shortage. In basic a new inquiry is pending for 1000 tons for the first quarter. Southern iron is firm at $14, Birmingham, as a minimum quotation for delivery through the first half. For prompt shipment and for the first half we quote, delivered Cleveland, as follows:

Bessemer	$18.15 to $18.40
Basic	17.25 to 17.50
Northern No. 2 foundry	17.25 to 17.50
Southern No. 2 foundry	18.35 to 18.60
Gray forge	16.75 to 17.00
Jackson County silvery, 8 per cent. silicon	20.05 to 21.55

Old Material.—The market continues fairly active and firm. Considerable tonnage has been sold by Cleveland dealers to local mills and for shipment to the Valley and other Ohio points. The demand for heavy melting steel is heavy and other grades are moving fairly well. The Erie and Big Four railroads have lists out which will close Wednesday. Prices are unchanged. We quote f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling	$15.00 to $15.50
Old iron rails	17.50 to 18.00
Steel car axles	18.75 to 19.25
Heavy melting steel	14.50 to 15.00
Old car wheels	13.50 to 14.00
Relaying rails, 50 lb. and over	23.00 to 23.50
Agricultural malleable	12.50 to 13.00
Railroad malleable	14.00 to 14.50
Light bundled sheet scrap	12.50 to 13.00

Per Net Ton.

Iron car axles	$20.50 to $21.50
Cast borings	8.50 to 8.75
Iron and steel turnings and drillings	9.00 to 9.25
Steel axle turnings	9.25 to 9.50
No. 1 busheling	12.50 to 13.00
No. 1 railroad wrought	14.00 to 14.50
No. 1 cast	13.00 to 13.50
Stove plate	10.00 to 10.50
Bundled tin scrap	11.00 to 11.50

Coke.—The market continues very firm. Some foundry coke has been sold for first half delivery at $3.50, but $4 per net ton at oven appears generally to be the minimum quotation for contract, and some producers are asking $4.25. For prompt shipment quotations range from $4.25 to $4.65. Virginia grades are quoted at $3.50 to $3.75 for the first half. Standard Connellsville furnace coke is quoted at $3 to $3.50 for contract and about $4 for prompt shipment.

Finished Iron and Steel.—Mills are getting in no better shape on shipments and consumers in need of material for immediate use are buying small lots from warehouses at stock prices. Jobbers are unable to keep their stocks up and buyers are compelled to take such sizes as are available. New inquiries for contracts are few in number. Consumers realize the crowded condition of the mills and generally are not coming into the market. Some of the mills have nothing whatever to sell before July 1. The price situation shows no change. There are no established prices for material for quick shipment and producers who have anything to offer can get close to warehouse prices for it. Eastern mills have become filled up so that material can no longer be had from them for prompt shipment. These mills are now promising delivered within six or eight weeks on plates and 60 to 90 days on structural material. For Western shipment they continue to quote plates at 1.60c. and structural material at 1.55c. There is not much inquiry for shapes for new work. The Massillon Bridge & Structural Company has taken 300 tons for a local factory building. The Great Lakes Dredge & Dock Company was low bidder for additional piers for the Superior avenue viaduct, Cleveland, requiring about 2500 tons of sheet steel piling and reinforcing bars, but owing to an error new bids will probably be asked for. Sheet specifications are heavy and some of the mills can take on no more tonnage for this year's delivery. Some contracts for the first quarter are being taken at the regular prices, 2.25c. for No. 28 black and 2.40c. for No. 28 galvanized. Rivet prices are unchanged; contracts are being placed for the first quarter at a $2 a ton advance over current prices. Warehouse prices are unchanged at 1.95c. for steel bars and 2.15c. for shapes and plates.

Cincinnati

CINCINNATI, OHIO, November 6, 1912.—(*By Telegraph.*)

Pig Iron.—Considerable buying of small lots of foundry iron for filling in is proceeding, but the inquiry is light. The bulk of the limited business booked is brought out through direct solicitation of salesmen. There is considerable complaint in some quarters as to delayed shipments on contracts, which is tangible evidence that the melt is really larger than is generally realized. Another buying spurt is expected soon, as many consumers, for one reason or another, have postponed purchasing to cover nearby requirements, and the strength of the market is such as to deem it advisable to make provision for at least a first quarter's supply. Several Southern producers are slow in quoting for strictly second quarter delivery, and quotations given for that period range all the way from $14.50 to $15, Birmingham. It has been rumored that the prompt shipment price of $14, Birmingham, on No. 2 foundry has been shaded, but if so the quantity involved was too small to affect the general market quotation. Rumors that southern Ohio iron was sold below $16.50, Ironton, were probably based on a few sales of special analysis iron that the furnaces were glad to get off their hands. A Michigan buyer is expected to close soon for 1000 tons of Northern basic for shipment in the next four months, but the largest inquiry for foundry iron is from a nearby melter, totaling about 400 tons. The silvery irons are not in much demand but the present price is firm at $19, Ironton, based on 8 per cent. analysis. Malleable is slow, and is quoted at $16.50, Ironton, for any shipment up to April 1. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern Ohio coke, No. 1	18.20 to 18.70
Southern coke, No. 2 foundry and 2 soft	17.25 to 17.50
Southern coke, No. 3 foundry	17.00 to 17.50
Southern, No. 4 foundry	16.75 to 17.25
Southern gray forge	16.50 to 17.00
Ohio silvery, 8 per cent. silicon	20.20 to 20.70
Southern Ohio coke, No. 1	18.20 to 18.75
Southern Ohio coke, No. 2	17.70 to 18.20
Southern Ohio coke, No. 3	17.45 to 17.95
Southern Ohio malleable Bessemer	17.20 to 17.70
Basic, Northern	17.70 to 18.20
Lake Superior charcoal	19.25 to 19.75
Standard Southern car wheel	25.75 to 26.25

(By Mail)

Coke.—There are no stable prompt shipment quotations. It is simply a question of being able to make deliveries, and both furnace and foundry coke have sold at figures far in advance of prices obtained for several years. There has been considerable buying to fill in for immediate requirements, and as high as $4.25 has been paid for a small quantity of 48-hr. Connellsville coke. The average quotations on Connellsville, Wise County and Pocahontas furnace coke range from $3.50 to $4.25 per net ton at oven, with foundry coke bringing around $4.50. These figures being considered abnormal, buyers are slow in contracting, unless given a concession, that in some instances is said to have been done for the protection of old customers. It seems quite probable that high prices may prevail the entire winter. The demand for domestic and gas coke is also larger than for several years.

Finished Material.—The principal trouble with both mill representatives and local warehouses is in making deliveries on time. A number of mills are unable to promise shipments before April, and while local dealers generally had taken advantage of the opportunity for placing orders when the mills were not so hard pressed, there is considerable complaint over the slow delivery of material on which definite promises had been made. Structural material leads in the demand locally, but both galvanized and black sheets are also good sellers, and the local mill is experiencing some trouble in making shipments on specifications on contracts previously made. Warehouse prices on steel bars are from 2.05c. to 2.10c. and on structural material 2.10c. to 2.15c.

Old Material.—As predicted, there has been a slump in prices and practically all grades of scrap material have eased off about 25c. a ton. There is not much business reported by local dealers, with the exception of the rolling mills, who continue fairly good customers. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, south-

ern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton.	
Bundled sheet scrap	$10.50 to $11.00
Old iron rails	14.75 to 15.25
Relaying rails 50 lb. and up	21.75 to 22.25
Rerolling steel rails	13.75 to 14.25
Melting steel rails	11.75 to 12.25
Old car wheels	13.25 to 13.75
Per Net Ton.	
No. 1 railroad wrought	$11.75 to $12.25
Cast borings	7.75 to 8.25
Steel turnings	8.25 to 8.75
No. 1 cast scrap	11.50 to 12.00
Burnt scrap	8.25 to 8.75
Old iron axles	18.75 to 19.25
Locomotive tires (smooth inside)	12.25 to 12.75
Pipes and flues	8.25 to 8.75
Malleable and steel scrap	9.75 to 10.25
Railroad tank and sheet scrap	7.25 to 7.75

The Domhoff & Joyce Company, whose main offices are in Cincinnati, with branches in Chicago, Cleveland, Indianapolis and St. Louis, announces the transfer of W. J. Thompson from Chicago to St. Louis, succeeding W. G. Maguire, formerly sales agent at that point. Mr. Maguire has been appointed general sales agent, with headquarters at Cincinnati, and will have entire charge of the various traveling men of the company throughout the territory covered.

Birmingham

BIRMINGHAM, ALA., November 4, 1912.

Pig Iron.—The Birmingham pig iron market is nearer the basis of $14.50 than $14. The latter figure is positively the minimum for spot, and $14.50 is secured for the same delivery with apparently as much ease. Recent sales have not been large, yet the company with the largest supply of iron on hand has sold 30,000 to 40,000 tons in October. One interest which has been charging a minimum of $14.50 for several weeks reports aggregate sales of 2000 to 3000 tons, mostly in 100 to 300-ton lots, all of which went at $14.50 for spot and first quarter, with one lot of No. 4 foundry at $14. Probably some surprise will be created by the announcement that the leading interest has 50,000 tons of iron available for the first half of next year, as it has been stated that it was sold up to July 1. The quantity mentioned is held at $14.50 for the first quarter and $15 for the second quarter. These quotations indicate the trend of the market. A recent sale of basic iron made by the leading interest consisted of 6000 tons for the first quarter at $14.50 and 9000 tons for the second quarter at $15. The company could sell more basic if it had the iron to sell; but its own requirements limit its offerings. It will need an unusually large amount of its basic iron in the fore part of 1913 on account of the magnitude of rail orders. A recent order is for 4000 tons for a Chinese railroad, and the Nashville, Chattanooga & St. Louis has bought 10,000 tons. This is in addition to the 140,000 tons placed two weeks ago by the Louisville & Nashville, Harriman lines and others. Its other finishing mills will also consume a large amount of steel. Neither manufacturers nor consumers appear to be anxious about the future, the former being satisfied with the $14.50 level for some time to come with practical assurance that it will reach $15, while consumers appear to feel that they will be able to stand the gradual rises as they develop. As heretofore stated, home consumption is on the increase in several quarters and the enlarged production will scarcey affect the trend toward rising prices. Minimum prices, f.o.b. cars at Birmingham, are as follows:

No. 1 soft and foundry	$14.50
No. 2 soft and foundry	14.00
No. 3 foundry	13.75
No. 4 foundry	13.50
Gray forge	13.25
Basic	14.00
Charcoal iron	$24.00 to 25.00

Cast Iron Pipe.—Orders from Los Angeles, Cal.; Waco, Texas, and other Western points have been received by the local pipe makers and scattering lots from various points have come in, helping to fill order books already in bulging form. Prices continue at $25 for 4-in. and $23 for 6-in. and up, with $1 added for gas pipe.

Coal and Coke.—There is a stiff demand. Cars are in better supply than they have been, and it looks as if there will be no serious famine. Foundry coke rules at $3.50 to $3.75 per net ton, f.o.b. oven.

Old Material.—Light cast and machinery grades are in strong demand. Dealers report an excellent trade all round. They are standing firm on prices and buying as fast as selling. Prices f.o.b. cars Birmingham are as follows, per gross ton:

Old iron car axles	$15.50 to $16.00
Old steel axles	13.50 to 14.00
Old iron rails	14.00
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.50 to 11.00
No. 1 country wrought	9.00 to 9.50
No. 2 country wrought	8.50 to 9.00
No. 1 machinery	10.00 to 10.50
No. 1 heavy melting steel	9.50 to 10.00
Tram car wheels	10.00 to 10.50
Light cast and stove plate	8.50 to 9.00
Standard car wheels	12.00 to 12.50

St. Louis

ST. LOUIS, MO., November 4, 1912.

The week has been quiet so far as new business is concerned, but there has been no cessation of the urgent requests for shipment or in specifications on old contracts. Sales representatives here expect a renewal of the buying movement after election day.

Pig Iron.—Quotations last reported have held, but the new business has been chiefly in carload lots. The character of the demand indicates decided confidence on the part of consumers, much of the small lot business going to fill in special requirements, while specifications coming forward as well as insistence on quick shipment have been strong. Representatives of the furnaces see good buying not far away, many contracts having been measurably exhausted. The car shortage continues to be severely felt in this section.

Coke.—Demand is urgent on contracts, while new business is for small lots owing to the situation as to cars and supplies at ovens, neither oven representatives nor buyers being willing to contract far ahead. The best Connellsville 72-hr. selected foundry coke sold at $4.50 at oven, this price being made for "reasonably early shipment" conditions and the buyer being made to understand that prompt shipment was out of the question. A price of $4 has also been made for the same grade for shipment after January 1.

Old Material.—The scrap market showed no further tendency to soften, and the prices as quoted are well held, though conditions are quiet, largely due to the elections. Mills are buying fairly well, while the demand for relaying rails continues to grow more accentuated, with the dealers still harder pushed to get supplies. The lists out during the week included one from the Missouri Pacific, embracing about 1500 tons, the Frisco 700 tons, and the Big Four 500 tons. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.	
Old iron rails	$15.00 to $15.50
Old steel rails, re-rolling	15.00 to 15.50
Old steel rails, less than three feet	14.50 to 15.00
Relaying rails, standard section, subject to inspection	24.00 to 25.00
Old car wheels	15.00 to 15.50
Heavy melting steel scrap	14.50 to 15.00
Frogs, switches and guards, cut apart	14.00 to 14.50
Per Net Ton.	
Iron fish plates	$12.50 to $13.00
Iron car axles	20.50 to 21.00
Steel car axles	17.00 to 17.50
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	12.00 to 12.50
Railway springs	12.25 to 12.75
Locomotive tires, smooth	13.00 to 13.50
No. 1 dealers' forge	10.00 to 10.50
Mixed borings	8.00 to 8.50
No. 1 busheling	11.00 to 11.50
No. 1 boilers cut to sheets and rings	8.50 to 9.00
No. 1 cast scrap	12.50 to 13.00
Stove plate and light cast scrap	9.50 to 10.00
Railroad malleable	12.00 to 12.50
Agricultural malleable	11.00 to 11.50
Pipes and flues	8.50 to 9.00
Railroad sheet and tank scrap	8.00 to 8.50
Railroad grate bars	10.00 to 10.50
Machine shop turnings	9.00 to 9.50

Finished Iron and Steel.—The approach of the winter season is manifested in present quietness in new demand. Specifications on contracts are far ahead of originally anticipated requirements, as well as ahead of contract shipment, and the reports generally show that the consumers have made large bookings which will assure continuance for some time of the activity which has obtained up to the present. The total of new business has been satisfactory, but no large items have entered into it. A prospective contract beginning to cause considerable interest is one for the construction of a smelter in Arizona requiring about 5000 tons. Fabricators generally are using up material as fast as received. In standard steel rails there was no business nor any inquiries, this being an off month for this territory, even for consideration of next year's needs. The demand for tie plates, bolts and spikes has been good, though the approach of winter is also lessening the re-

quirements. Bars are very active, with the demand coming strongly from construction quarters as well as farm machinery interests. In light rails the buying has been good, chiefly from the coal interests, though the lumber people are not out of the market.

San Francisco

SAN FRANCISCO, CAL., October 29, 1912.

The month is closing without perceptible curtailment in the general consuming demand, and complaints of slow deliveries have become a matter of routine. Aside from snow in the mountains, which has stopped work on concrete dams, weather conditions have been fairly favorable, and political developments have no apparent effect on the situation. Many mill agents report a curtailment of allotments for Pacific coast delivery, and while all are making efforts to take care of their regular customers not many are soliciting new business. In some lines a few merchants and large consumers have covered their first quarter requirements, but more business is offered than can be placed. Jobbing prices in several lines have been marked up in sympathy with Eastern markets, though some consuming trades are making low prices on their products.

Bars.—Some bar orders for concrete dam construction have been canceled, and bids on the Los Angeles wharf construction have been rejected, which has eased the situation somewhat in reinforcing material. Local mills are able to take care of considerable prompt-delivery business, though they are running at capacity and one is preparing to increase its output. Offerings of either foreign or Eastern bars from store are limited, and many small buyers find difficulty in filling their requirements. Merchants' specifications for soft steel bars show no curtailment, the consuming demand being fully maintained. Local mills quote reinforcing bars in carloads, for prompt delivery, at 2.20c., but expect an advance within the week. Soft steel bars in small lots from store are held at 2.65c., and iron at 2.55c.

Structural Material.—Local work still consists mainly of small jobs, which are fairly numerous. The outlook is improving, however, in all parts of the coast, with reports of important buildings to be figured shortly at Portland and Los Angeles. Dyer Bros., this city, have contracts for the Hawaiian Pineapple Company's warehouse in the Islands, the Roche building at Pine and Jones streets, and other small work. Figures have been taken for the Schaw-Batcher Company's plant at South San Francisco, and on Oakland schools amounting to about 200 tons, and new bids are being received for the Los Angeles armory. The Oakland auditorium will be ready for figures in about a month. It is reported that bids will be taken January 6 for the U. S. Subtreasury building. The Oakland & Antioch Railway has secured permission to build a bridge at the head of Suisun Bay, at an estimated cost of $1,600,000. Two new projects mentioned at Vancouver, B. C., are the Investors' Guarantee building and a large store for the Hudson Bay Company. Tacoma, Wash., will take bids shortly for a new high school. Some mills are refusing new business in plain shapes. Beams and channels, 3 to 15 in., in small lots from store, are quoted at 2.75c.

Rails.—According to an unconfirmed report, the Oakland & Antioch Railway has placed an order with the U. S. Steel Products Company for 10,000 tons. Otherwise no single transactions of unusual importance are noted, though scattering orders comprise a fair tonnage, and conditions are favorable for much new construction next year. The San Jose Terminal Company is preparing to build a short line between that town and Alviso, and a road is projected from San Jose to the New Almaden mine. It is reported that a logging road will be built soon for the T. B. Walker timber development in Plumas county, Cal.

Sheets.—Specifications continue extremely heavy, and stocks are badly broken, the distributive movement showing no sign of curtailment. There is a steady stream of inquiries for first quarter delivery, but few agents are taking on any new business at present. Some good sized contracts are coming out for sheet products, manufacturers of which have covered their requirements for some time ahead. Jobbers quote galvanized sheets, No. 26, at 4.85c.

Plates.—Large contracts for riveted pipe work are still coming out, and some of them are said to have been taken on the basis of former prices by manufacturers who placed heavy orders at those figures. A heavy tonnage for the San Fernando siphon of the Los Angeles acqueduct is reported let to the Lacy Mfg. Company, and the Schaw-Batcher Company has taken an 800-ton contract for the Alameda Sugar Company, Meridian, Cal., calling for No. 10 sheets and 3/16-in. plates. The city of New Westminster, B. C., has taken bids on 1660 ft. of 48-in. pipe. The jobbing movement continues active. Small lots, from store, are quoted at 2.75c.

Merchant Pipe.—Merchants' specifications are extremely heavy, and there is a general anticipation of higher prices in the near future. Deliveries of oil-country goods are particularly slow, and the demand has an appearance of activity owing to the difficulty buyers experience in placing orders. A few fairly large line pipe inquiries are reported. Practically all merchants are short of stock, and local consuming trades experience considerable delay in carrying out their contracts.

Cast Iron Pipe.—While small routine business is running into a fair tonnage, the expected buying for large municipal projects is slow to develop. There is plenty of business in prospect, however, and some substantial orders are expected before the end of the year. This city is considering the installation of distributing mains in districts now unprovided for. Quotations, f.o.b. San Francisco, are $38.50 per net ton for 4-in.; $36.50 for 6 to 10-in., and $36 for larger sizes.

Pig Iron.—The local situation has changed materially in the last two months. Arrivals of foreign iron were very light early in the year, but nearly every grain ship arriving this fall has brought some pig iron, including several cargoes of 1,000 tons or over. The supply is now comparatively heavy, and with a slight tendency to easiness in prices. Southern iron finds little demand, though a few contracts have been placed. Some European iron is still arriving, and with the possibility of Chinese iron coming in next year buyers show little interest. No. 2 Southern foundry iron is now quoted at $24.60, and holders of corresponding grades of English iron would probably be willing to shade this quotation a little.

Coke.—Most of the coke used by foundries and smelter in this vicinity is English and German, with some Australian and limited quantities of Connellsville and Southern. Little, if any, is received from British Columbia, and only a small amount of by-product coke is imported. Several heavy cargoes have arrived on the coast this month, amounting to about 7000 tons, and the market is rather easy and unsettled, quotations showing considerable divergence. Some Alabama coke on the spot is quoted at $12 per net ton, while some importers quote a range of $10 to $14 per gross ton, ex ship, and wholesale dealers quote Pelton Main and German Syndicate coke at $14 per gross ton, ex yard.

Old Material.—The local buying movement in most lines of scrap is fairly active, and there is a continued demand for export. Values are firmly held at the former level. Prices are quoted as follows: Cast iron scrap, per net ton, $15; steel melting scrap, per gross ton, $12.50; wrought scrap, per net ton, $12.50 to $15; rerolling rails, per net ton, $11.

The Monarch Iron Works has taken a $10,000 contract for ornamental iron and brass work for the Downtown Realty Company's 6-story building at Eddy and Mason streets.

Balkan War Affects German Markets

BERLIN, October 24, 1912.

Notwithstanding the meagerness of news from the iron trade this week, it appears evident that the war is having some effect in restricting new business. Thus, the Pig Iron Syndicate, which began this week to take 1913 orders, after having adopted its new price list about the beginning of the month, is finding sales unexpectedly slow. Inquiries had been coming in for some week in large volume, and this gave grounds for expecting that orders would be placed with a rush as soon as business was opened. But sellers are now holding back owing to the international political situation, and are waiting till some of the clouds of uncertainty now obstructing the political sky have cleared away. Hence new business in pig iron is described as extraordinarily quiet. Other reports admit, indeed, that a quieter pace in placing new orders is observed in the general market, and also that the war is restricting business in the cutlery trade at Solingen to a marked degree; but it is added that specifications on current orders are coming in at a rapid rate, and that the general market hardly shows any effects from the war. The foreign markets, in particular, are taking large amounts of iron and steel.

For the first time in many weeks there is not a

single price advance to be reported from the German market, which fact is of itself good evidence of the quieter tendency caused by the war. From Belgium, on the other hand, comes news of a further advance of the export price for steel bars by one shilling, and that the price of scrap for the home market has been raised 1.50 to 2 francs, after it had been under much pressure for some months. Russia also sends in news of price advances. Bars have been raised about 30c. per pood (36 lb.), and heavy and light plates about 15c. The East French Pig Iron Syndicate has adopted a price of 90 francs for No. 3 foundry iron, which is described as a considerable advance.

The mills have latterly been hampered to some extent by the delay in coal and coke deliveries, due to what is described as the worst shortage in freight cars ever known in Germany. This caused the September production of coal to drop about 1,000,000 tons below that of August.

Buffalo

BUFFALO, N. Y., November 5, 1912.

Pig Iron.—Sales have been small as compared with previous weeks, perhaps an example of pre-election effect. Inquiries are numerous, however, and it is anticipated that heavy buying will develop after election, the inquiry being large as compared with the available supply. The phenomenal increase in consumption which is taking place steadily will unquestionably bring in a further large supplemental demand between now and January 1, larger than producers will be able to supply. Many foundries have brought their melt up 50 to 100 per cent. over that which they contemplated when they made present contracts for raw materials and are crowding furnaces with urgent requests for deliveries not due for 30 to 60 days. The labor situation is improving very generally, so that melters are not now hampered in this respect to the extent that they were. Prices are firm with small advances in some grades. We quote as follows f.o.b. Buffalo for first half delivery:

No. 1 foundry	$17.50 to $17.75
No. 2 X foundry	17.25 to 17.50
No. 2 plain	17.00 to 17.25
No. 3 foundry	17.00
Gray forge	16.75 to 17.00
Malleable	17.50 to 17.75
Basic	17.50 to 18.00
Charcoal, regular brands and analysis	18.75 to 20.25
Charcoal, special brands and analysis	22.00

Finished Iron and Steel.—Demand keeps up to the average of the past few months and agencies find themselves obliged to turn back orders. The shortage of semi-finished materials at mills is causing many producers to cut down to single turn on finished products, resulting in further extension of deliveries and making more stringent the necessity for declining new business, as it is impossible for mills to determine when they can safely promise deliveries and they are unwilling to book orders as far ahead as it would be necessary for them to do under these uncertain delivery conditions. Some of the leading producers however, continue to accept orders at present prices for delivery at mills' convenience. For 1912 and first quarter delivery it is practically impossible for buyers to find openings with any of the steel companies for the considerable tonnages they are desirous of placing. Orders of some importance for power transmission material and for chain have been placed; also for tin plate. In the latter commodity an advance of 10c. per base box is expected in the near future. Prices for sheets are very firm with active demand, and deliveries are becoming more extended. There has been no change in prices, except that the Eastern Steel Company has sent out notices advancing the price of shapes to 1.60c. Pittsburgh, effective November 2. In structural lines fabricators are quite fully booked for several months and the inability to obtain steel is postponing the starting of construction work on all new building projects until next spring. Architects Colson & Hudson are ready for bids on revised plans for the Foster-Milburn Company's factory and laboratory building, Buffalo, taking 200 tons of steel. Bids will be opened November 29 for steel for the Hutchinson high school building, 1400 tons, and plans for the new Masten Park high school, 1400 tons of steel, largely Bethlehem sections, will soon be ready for bids. The steel for the power house at the New York Central's passenger station at Rochester will be erected by the Buffalo Structural Steel Company.

Old Material.—The market is somewhat quieter than in recent weeks, demand having slackened in most lines. It is probable, however, that the quiet condition will be but temporary, dealers anticipating a speedy resumption of demand. Prices are firm and unchanged. We quote as follows per gross ton f.o.b. Buffalo:

Heavy melting steel	$14.75 to $15.25
Low phosphorus steel	17.00 to 17.50
No. 1 railroad wrought	16.00 to 16.50
No. 1 railroad and machinery cast scrap	14.50 to 15.00
Old steel axles	16.75 to 17.00
Old iron axles	24.50 to 25.00
Old car wheels	15.50 to 16.25
Railroad malleable	13.50 to 14.00
Boiler plate sheared	15.00 to 15.50
Locomotive grate bars	11.75 to 12.25
Wrought pipe	10.50 to 11.00
Tank iron	10.75 to 11.25
Wrought iron and soft steel turnings	8.75 to 9.00
Clean cast borings	8.00 to 8.50

Boston

BOSTON, MASS., November 5, 1912.

Old Material.—The scrap market is in a mildly chaotic condition. Some hesitancy is observed in buying at prevailing prices. The steel mills are taking a large tonnage of material direct from the railroads, which has its influence, and the fact that election day is at hand results quite naturally in conservatism. As to prices, the market has not changed in the week. The quotations given below are of prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$12.75 to $13.00
Low phosphorus steel	14.00 to 15.00
Old steel axles	15.00 to 15.50
Old iron axles	23.00 to 23.50
Mixed shafting	14.75 to 15.25
No. 1 wrought and soft steel	12.25 to 12.75
Skeleton (bundled)	10.75 to 11.25
Wrought iron pipe	10.75 to 11.00
Cotton ties (bundled)	10.75 to 11.00
No. 2 light	4.50 to 5.00
Wrought turnings	8.50 to 8.75
Cast borings	8.00 to 8.50
Machinery, cast	13.50 to 14.00
Malleable	11.00 to 11.50
Stove plate	9.00 to 9.50
Grate bars	8.00 to 8.25
Cast-iron car wheels	13.50 to 14.00

New York

NEW YORK, November 6, 1912.

Pig Iron.—The largest pending inquiry, sent out early this week, is for 3600 tons of foundry iron for the first half of 1913, coming from a large New Jersey manufacturer of fittings and plumbing supplies. Equal amounts are wanted of iron with silicon from 2 to 2.25 per cent., and of iron with silicon from 2.75 to 3.25 per cent. A large soil pipe interest is still in the market for No. 3 and No. 2 plain iron for its Eastern plants, and a relatively small percentage of No. 2 X iron. A number of piecing-out purchases are being made for 1912, but the greater part of current buying is for the first quarter and first half. Prices have not changed in the past week; on spot iron they probably average a little higher. A number of inquiries for malleable iron have appeared, these going largely to furnaces in the Buffalo district and are from plants in New York State, Massachusetts, and in some cases in Canada. Canadian buyers are still seeking iron on this side, finding difficulty in getting desired deliveries of British iron, which is also high priced, with an advancing tendency. Eastern Pennsylvania furnaces are holding quite firmly to prices recently asked. It is evident that most of the smaller foundries have yet to buy for deliveries after January 1. We quote as follows for Northern iron at tidewater: No. 1 foundry, $18.25 to $18.50; No. 2 X, $17.75 to $18.25; No. 2 plain, $17.25 to $17.75. Southern iron is quoted at $18.25 to $18.50 for No. 1 foundry and $18 to $18.25 for No. 2.

Structural Material.—It is estimated that 100,000 tons of material will come into the market for figuring within the next three months, exclusive of any subway or elevated railroad work. The closing of awards for structural buildings is dull at the present time, but there are large numbers of sizeable contracts now in the hands of fabricators for estimate. The condition is unusual for the season and indicates that neither price considerations nor belated deliveries are leading to abandonment of building work, but instead appear to be forcing the work a little forward, if anything. A price of 1.45c., Pittsburgh, with delivery at the pleasure of the mill, is claimed still to hold with one company,

except to buyers who are not regular customers; then 1.50c. is a minimum. Eastern Pennsylvania companies are holding generally for 1.60c., Pittsburgh, for new business. One interesting inquiry has just come into the market for 750 tons of bridge material for 46 plate girder and 16 beam bridges for the Imperial Taiwan Railways, Japan, the material to be ready for shipment on January 15 or to reach Osaka before the end of April. The Delaware, Lackawanna & Western is asking for bids on 3000 tons of bridge material for 1913. Recent awards include 1800 tons for a 12-story loft building, 42 West Thirty-third street, to Alfred E. Norton Company; 400 tons for the Hall apartment, West Ninety-second street, to Hinkle Iron Company; 925 tons for the Raleigh, Charlotte & Southern, to the McClintic-Marshall Construction Company; 360 tons for two lift bridges for the Pennsylvania Railroad over Bush and Gunpowder Creeks and 150 tons for two bridges, main line of the Pennsylvania, all to the Pennsylvania Steel Company; 400 tons for a street crossing for the Baltimore & Ohio at Baltimore to the American Bridge Company, and 1000 tons for 32 spans on the Long Island to the Fort Pitt Bridge Company. Among buildings listed a few weeks ago and now taking shape are the following: 12-story loft, 133 West Twenty-fifth street, 450 tons; 12-story apartment, 105 West Seventy-second street, 250 tons; 8-story loft, 377 Fourth avenue, 250 tons; 9-story loft, 102 West Sixty-ninth street, 250 tons. We quote plain material at 1.66c. to 1.76c., New York, for mill shipments, according to delivery, and 2.15c. from store.

Steel Plates.—Local demand for plates is very slow, but much of the business has been for quick shipment and premiums of $10 per ton have been obtained for shipment in two or three weeks. Plates are otherwise obtainable from Eastern mills from eight to ten weeks. The car business continues in large volume. Since last week's report about 7000 cars have been ordered, but the additional inquiries now bring up the total of live car business to 45,600 cars. The New York Central is about to inquire for 18,000 cars; the Illinois Central is regarded as definitely in the market for 6000 cars; the New York, Ontario & Western for 500 hoppers, 100 flat, 300 underframe box, 50 stock and 50 refrigerator, 1000 in all; the Louisville & Nashville is in the market for 1200 underframes for car bodies which it will build itself, and the Duluth & Iron Range and the Duluth, Missabe & Northern are in for a total of 1500 cars. The Pennsylvania Railroad has placed 2000 more cars with the Pressed Steel Car Company, 1000 box and 1000 steel coke cars. The Chesapeake & Ohio is to buy 3000 coal and coke cars. For the rest of the year we quote sheared plates at 1.76c. and universal plates, 1.81c.; for forward delivery, 1.66c. to 1.71c., all New York.

Iron and Steel Bars.—Conditions remain unchanged, specifications against contracts being made for the maximum quantities and new demand being made up of small individual orders. It is not believed that much of this business represents speculative buying in the sense that the buyer fears he may be caught short handed, but is rather the buying resulting from not properly taking care of actual needs. The result is that premiums as high as $15 a ton in carload lots is reported; in fact, some business of these proportions going at 2.50c., Pittsburgh, basis. Steel bars remain nominally at 1.40c., Pittsburgh, or 1.56c., minimum, New York, mill shipments, and from store, 2c. Refined iron bars are 1.60c. to 1.65c., New York, and from store, 2c.

Ferroalloys.—In a quiet market, prices of 80 per cent. ferromanganese are unchanged. The scarcity is unrelieved, and most of those who have spot or nearby material to dispose of are asking $75, Baltimore, although this price probably might be shaded. For delivery next year $61 is quoted. Ferrosilicon, 50 per cent., is quoted at $75, Pittsburgh, for carloads, $74 for 100 tons and $73 for 600 tons or over. The United States Steel Corporation is reported to be making inquiry for over 6000 tons of ferrosilicon to provide for its 1913 requirements.

Cast Iron Pipe.—The city of Providence, R. I., opened bids on 2500 tons on Monday. Private buying is less active for early delivery, but contracts for considerable quantities of small sizes have been entered for spring delivery and further inquiries are pending. The demand for large pipe still continues to lag. Carload lots of 6-in. are quoted at $24 to $25 per net ton, tidewater.

Old Material.—The demand from steel works and rolling mills has fallen off considerably, and requests are being received by dealers for the holding up of shipments. Mill operations are hampered by scarcity of coal, and the unloading of scrap is hindered by the scarcity of common labor. The diversion of shipments from one point to another is naturally having its effect on prices, which are slightly lower. All kinds of foundry scrap are in strong demand, possibly because of the advance in the price of pig iron and the growing scarcity in the supply of that commodity for prompt delivery. Dealers' quotations are nominally as follows, per gross ton, New York and vicinity:

Old girder and T rails for melting	$12.75 to $13.25
Heavy melting steel scrap	12.75 to 13.25
Relaying rails	22.50 to 23.00
Rerolling rails	15.00 to 15.50
Iron car axles	23.00 to 24.00
Old steel car axles	17.00 to 17.50
No. 1 railroad wrought	15.00 to 15.50
Wrought iron track scrap	13.50 to 14.00
No. 1 yard wrought, long	13.00 to 13.50
No. 1 yard wrought, short	12.50 to 13.00
Light iron	5.50 to 6.00
Cast borings	9.00 to 9.50
Wrought turnings	9.50 to 10.00
Wrought pipe	12.00 to 12.50
Old car wheels	14.00 to 14.50
No. 1 heavy cast, broken up	13.00 to 13.50
Stove plate	10.25 to 10.75
Locomotive grate bars	10.00 to 10.50
Malleable cast	10.75 to 11.25

Metal Market

NEW YORK, November 6, 1912.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead		Spelter	
Oct.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
31	17.62½	17.25	50.20	5.00	4.85	7.50	...
Nov.							
1	17.62½	17.25	50.35	5.00	4.82½	7.50	7.35
2	17.62½	17.25	.....	5.00	4.82½	7.50	7.35
4	17.50	17.25	50.12½	4.75	4.60	7.50	7.35
6	17.50	17.25	50.15	4.75	4.60	7.50	7.35

Copper is lower and sales have been made at the reduced price. Tin maintains its recent price average, and spot metal has been more active. Lead declined sharply on Monday. Spelter is dull and unchanged. Antimony prices maintain their level.

New York

Copper.—Although the last week brought some improvement in the copper market in regard to increased activity, it is still rather quiet. The buying did not reach large proportions, as it was mostly resale or speculative electrolytic copper that was offered and purchased on a basis of 17.25c., cash New York, and 17.37½c., delivered in the Naugatuck valley, cash 30 days. Most of the large producers are declared to be holding out for a higher price but not getting it. Lake is holding up well as regards price, in the absence of pressure to sell or inclination to buy. That Lake copper can be had at prices below those of the producers is evident from offerings made but which found no takers. There is not enough resale copper available to last long in the face of any active demand, but under the circumstances the prices asked for it make the market. As heretofore stated, consumers are well supplied for the present, which is one reason for the inactivity, while at the same time it is natural for them to await the next report of the Copper Producers' Association. Speculation is keen as to whether a substantial increased surplus in stocks will be shown. Copper is quoted in New York at 17.50c. for Lake and 17.25c. cash for electrolytic. The price in London to-day is £76 5s. for spot and £76 17s. 6d. for futures. The exports this month were 480 tons.

Copper Averages.—The Waterbury average for the month of October was 17.75c. The average New York price for Lake copper, based on daily quotations in *The Iron Age*, was 17.79½c. for Lake and 17.58½c. for electrolytic.

Pig Tin.—Tin has been in better demand, especially for prompt shipment. It is noticeable that consumers, in buying tin, are very insistent upon prompt shipment, from which it may be inferred that they have not enough to carry them very far, and hence there is a feeling that more active buying must soon materialize. On Monday there were several of these inquiries for spot or prompt shipment and some buying resulted, but the interest shown in futures was slight. Both at home and abroad, prices have maintained their recent average although in London yesterday tin, acting in characteristic fashion, fell off £1 10s., but this was practically recovered to-day. Tin statistics for October showed that the total visible supply had fallen off 2510 tons and that United States deliveries were 3850 tons, an increase of 350 tons for the month. The figures are generally construed as sustaining the comparative high price of the metal. The price of tin in New York to-day is 50.15c.

and in London £228 15s. for spot and the same figures for futures. The arrivals of tin this month have been 405 tons and there is afloat 1270 tons.

Lead.—The one big feature of the lead situation the past week was the action of the American Smelting & Refining Company on Monday of reducing its price $7 a ton, or 0.35c. a lb., bringing its New York price down to 4.75c. Independents, through their low quotations offered in their anxiety to obtain business, are credited with having precipitated the cut in price. The market has been dull, and there is some conjecture as to just how far the lower prices will induce trading. Lead is quoted to-day at 4.75c. in New York and 4.60c. in St. Louis.

Tin Plates.—There is little to say with regard to tin plates except that new business of large caliber has fallen off, although in a small way jobbers find the demand good. The price is unchanged.

Spelter.—The metal is unchanged and dull at 7.50c., New York, and 7.35c., St. Louis, and the probabilities are that this price could be shaded a little. It was reported a few days ago that the United States Steel Corporation had bought 2000 tons of spelter in Europe at 1c. under the American price, with the intention of using the metal for export purposes and obtaining advantage of the drawback duties.

Antimony.—There has been no change in antimony as regards price and most of the business has been of a resale character from second hands. Cookson's is quoted at 10.50c., Hallett's at 9.75c. and Hungarian and Chinese grades at 9.37½c. to 9.50c.

Old Metals.—The market is quiet. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	16.75 to 17.00
Copper, heavy and wire	16.50 to 16.75
Copper, light and bottoms	14.75 to 15.00
Brass, heavy	10.25 to 10.50
Brass, light	8.50 to 8.75
Heavy machine composition	13.75 to 14.00
Clean brass turnings	9.75 to 10.00
Composition turnings	12.00 to 12.50
Lead, heavy	4.75
Lead, tea	4.50
Zinc, scrap	6.25

Chicago

NOVEMBER 4.—Weakness in tin has reduced slightly the prices paid for the old metal in this market. The leading interest in the lead industry has reduced its prices. Spelter is also off a fraction of a cent. We quote as follows: Casting copper, 17.75c.; Lake, 17.87½c. to 18c., in carloads for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 51.50c.; small lots, 54c.; lead, desilverized, 4.75c. for 50-ton lots; corroding, 5c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 7.50c.; Cookson's antimony, 11.50c., and other grades, 10.50c. in small lots; sheet zinc is $9, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 15.50c.; copper bottoms, 14c.; copper clips, 15c.; red brass, 12.75c.; yellow brass, 10c.; lead pipe, 4.25c.; zinc, 5.50c.; pewter, No. 1, 33c.; tinfoil, 39c.; block tin pipe, 45c.

St. Louis

NOVEMBER 4.—The metal market has been slightly easier, but with only small recessions in some prices. Lead is lower at 4.65c.; spelter, 7.25c. to 7.35c., according to delivery; Lake copper, 17.97½c. to 18.22½c.; electrolytic copper, 17.72½c. to 18.10c.; tin, 50.15c. to 50.70c.; antimony, Cookson's, 10.85c. In the Joplin ore district the week's production has been 6500 tons of zinc blende, the greatest in the history of the district. The shipments, however, were not as heavy, many companies holding their output for better prices. The basic price for grades carrying 60 per cent. was from $52 to $58 per ton, with the top price for the best lots $61. The generally good grades brought $55 to $56. The top price for calamine was $39, the basis range for grades carrying 40 per cent. ranging from $31 to $34. Lead ore brought $62 for 80 per cent. We quote miscellaneous scrap metals as follows: Light brass, 6.50c.; heavy brass and light copper, 10.50c.; heavy copper and copper wire, 13c.; pewter, 25c.; tinfoil, 32c.; zinc, 4.50c.; lead, 4c.; tea lead, 3c.

The Trumbull Steel Company, Warren, Ohio, of which Jonathan Warner is president, expects to have its new sheet and tin plate mills in operation about next May. The plant is laid out for a total of six sheet mills and six tin mills, but five sheet and five tin plate mills will now be erected.

Iron and Industrial Stocks

NEW YORK, November 6, 1912.

Greater strength has characterized the stock market in the past week. European advices have been less threatening and the pressure on American stocks subsided. Iron and industrial stocks have shown some advance from the levels recorded the previous week. The range of prices on active iron and industrial stocks from Wednesday of last week to Monday of this week was as follows:

Bald. Loco., com.	56½- 57	Railway Spg., com.	36½
Bald. Loco., pref.	107 -107¼	Republic, com.	31 - 31⅜
Beth. Steel, com.	44 - 46½	Republic, pref.	92 - 92¾
Beth. Steel, pref.	73½- 74½	Sloss, com.	54
Can, com.	38⅜- 42	Pipe, com.	19¼- 20¼
Can, pref.	120 -123	Pipe, pref.	62¾
Car & Fdry., com.	58½- 59½	U. S. Steel, com.	73¾- 76¼
Car & Fdry., pref.	119	U. S. Steel, pref.	112 -114½
Steel Foundries	41 - 42⅛	Westinghouse Elec.	81½- 82¾
Colorado Fuel	34⅜- 36⅛	Va. I. C. & Coke	63 - 64½
General Electric	180 -181¼	Am. Ship, pref.	104½
Gr. N. Ore. Cert.	45¼- 47½	Chic. Pneu. Tool	53 - 54
Int. Harv., com.	120½- 121¾	Cambria Steel	48½- 51⅜
Int. Pump, com.	24⅛- 26	Lake Sup. Corp.	30⅛- 31
Int. Pump, pref.	78⅝	Pa. Steel, pref.	95
Locomotive, com.	41 - 44¾	Warwick	10¾- 11
Locomotive, pref.	106	Crucible Steel, com.	17 - 18
Nat. En. & St., com.	20½- 21½	Crucible Steel, pref.	95 - 95⅝
Pressed St., com.	37¼- 38½	Harb. Wk. Ref., com.	50
Pressed St., pref.	100½-101½		

Dividends Declared

The Pittsburgh Steel Company, regular quarterly, 1¾ per cent., on the preferred stock, payable December 2.

The American Radiator Company, regular quarterly, 2 per cent. on the common stock, payable December 31, and 1¾ per cent. on the preferred stock, payable November 15.

The Canadian Car & Foundry Company, regular quarterly, 2 per cent. on the common stock, payable December 2.

The International Harvester Company, regular quarterly, 1¾ per cent. on the preferred stock, payable December 2.

Continued Strength in British Market

Pig Iron Higher—Tin Plates Regarded Low—American Rails for Australia

(*By Cable*).

MIDDLESBROUGH, ENGLAND, November 6, 1912.

Pig iron is firmer. There have been good exports from Middlesbrough, but there is general scarcity of prompt iron and the increased buying is regarded as due to the fact that more is doing in merchant material. Stocks of pig iron in store amount to 254,265 tons.

Semi-finished material is firm though dull. Tin plates, however, which are dull, are regarded as selling at prices close to cost. Ferromanganese is wanted for America but some makers refuse to quote. The United States Steel Corporation, it is rumored, has sold 18,000 tons of rails for Australia. We quote as follows:

Cleveland pig iron warrants (closing Tuesday), 66s. 9d. against 66s. 6d. one week ago, and 66s. 1½d. two weeks ago.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 67s. 6d., an advance of 6d. from last week, which was up 3d. from the previous week.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 17s. 6d. for January-March delivery.

German sheet bars, f.o.b. Antwerp, 110s.

German 2-in. billets, f.o.b. Antwerp, 105s.

German basic steel bars, f.o.b. Antwerp, £6 5s.

Steel bars, export, f.o.b. Clyde, £7 15s. to £7 17s. 6d.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £7 7s. 6d.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yard, £8 2s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 15s.

Steel rails, export, f.o.b. works port, £6 15s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 15s. 6d.

The Republic Iron & Steel Company, Youngstown, Ohio, has placed a contract with the H. Koppers Company, Chicago, for the building of 68 Koppers by-product coke ovens to have a daily capacity of about 1000 tons.

Personal

B. E. Hutchinson, engineer and steel mill superintendent of the Grand Crossing Tack Company, Chicago, has severed that connection and has gone abroad under contract with the Blair Open Hearth Furnace Company, Ltd., of London, to take charge of the engineering work in connection with installing Blair ports in England and on the Continent.

Henry K. Swinsco has resigned as assistant superintendent of the South works of the Worcester plant of the American Steel & Wire Company, and has been made superintendent of the Morgan Spring Company of that city.

Edward J. Manning has resigned as vice-president and general manager of the Royal Typewriter Company, Hartford, Conn. He was presented with a hall clock by the employees of the company in token of their esteem.

E. J. Kearney of Kearney & Trecker, Milwaukee, Wis., manufacturers of milling machines, was taken ill with pneumonia at Boston three weeks ago and has been in a hospital in that city since. His condition is somewhat improved and his recovery is confidently expected.

Henry Ralston, founder and vice-president of the Ralston Iron Works, San Francisco, has undergone a serious operation at the St. Francis Hospital in that city.

George A. Thompson, formerly with the Sellers Mfg. Company, Chicago, has become associated with the Deforest Sheet & Tin Plate Company, at its Chicago office. He will also represent the Buffalo Copper & Brass Rolling Mill.

O. M. Jones has established himself at 30 Church street, New York, as jobber and manufacturer's agent for steam, water, air, gas and oil equipment, having on September 1 severed his connection with the Ballwood Company, of whose pipe department he was manager and manager of sales for several years. Prior to this connection Mr. Jones was with the National Tube Company for a long period. He is an expert in the manufacture of high-pressure piping. He now represents W. K. Mitchell & Co., Philadelphia, manufacturer of wrought pipe, pipe bends and welded nozzles; the Locke Regulator Company, Salem, Mass., damper regulators, regulating valves, automatic engine stops, etc., and Thomas C. Basshor, Baltimore, Md., boilers and tanks.

Arthur Windsor Richards, of Army and Navy Mansions, London, Eng., has been appointed the special representative of the board of directors of the New Russia Company, Ltd., and general superintendent of its works in Russia. The company owns large iron and steel works and collieries. Mr. Richards will make periodic visits to Russia.

P. A. Hoffman, sales manager of the New York branch of the B. F. Sturtevant Company, became associated November 1 with Evans, Almirall & Co., contracting engineers, Dominick and Clarke streets, New York, in their engineering sales department.

G. T. Greer, for five years traffic manager and purchasing agent for the Virginia Bridge & Iron Company, Roanoke, Va., has resigned to engage in other business.

John Reid, Jr., for six years in charge of the Pittsburgh office of the Stowe-Fuller Company of Cleveland, Ohio, has resigned and has been made manager of sales for A. J. Haws & Sons, Ltd., Johnstown, Pa., manufacturers of fire brick. For the present, all sales of the company will be handled from Johnstown, Pa.

W. P. Siebert, manager of sales of the billet and rail bureau of the Carnegie Steel Company, Pittsburgh, has returned from an extended business trip to the Pacific coast.

D. H. Friedman, president United American Iron & Steel Company, Albany, N. Y., has returned from Europe after a four months' absence.

E. W. Beadel, vice-president and general manager Pennsylvania Engineering Works, New Castle, Pa., and J. K. Furst, chief engineer, sailed for Europe last week for a trip of five or six weeks.

Albert L. Nash of the pig-iron firm of Crocker Brothers, New York, met with an accident while passing through the steel wheel plant at Homestead in an inspection trip at the Pittsburgh meeting of the American Iron and Steel Institute October 26. A fragment of a steel wheel, which strangely exploded, probably from internal strains just after coming from a press, struck Mr. Nash in the leg, causing a compound fracture. He is now at West End Hospital, Pittsburgh.

The Pacific coast business of Milliken Bros., Inc., is now handled by Charles McGonigle, formerly Northwestern representative, who has moved his office from Portland, Ore., to San Francisco, Cal.

Sanford E. Thompson, consulting engineer for structural steel and reinforced concrete work, has established an office at 141 Milk street, Boston, Mass., but he will retain his offices and laboratory at Newton Highlands, Mass.

Adolph L. De Leeuw, mechanical engineer of the Cincinnati Milling Machine Company, read a paper before a joint meeting October 17 of the Cincinnati section of the American Society of Mechanical Engineers and the Engineers' Club of that city on the trend of modern engineering, treating of the development of the inventor into an economist.

Obituary

PETER PATTERSON, Pittsburgh, prominent in engineering and iron and steel circles, died October 30, aged 70 years. He lived less than a month after severing his connection with the National Tube Company, having retired October 1. He was born in Jeddurgh, Scotland, and spent his early days at that place, going to Edinburgh when 21, where he worked at his trade as an engineer. He came to America in 1866 and for several years worked in New York and Boston. He went to McKeesport in 1871, and in 1881 was appointed superintendent of the McKeesport works of the National Tube Company. He continued in that capacity until 1897, when he built the seamless tube works at Christy Park. For 10 years preceding his retirement he had been consulting engineer for the company and also attended to all its patent business.

W. B. DAVOCK, who had been in charge of the vessel properties of H. H. Brown & Co., Cleveland, Ohio, since 1890, died November 3, aged 66 years. He was born in Buffalo and in the early seventies located in Cleveland, where he opened a pig iron and ore brokerage office. Later he was in partnership with John N. Glidden under the name of Davock & Glidden. This firm was dissolved in 1879 and Mr. Davock went into the pig iron and ore department of H. H. Brown & Co., later taking charge of their vessel properties. On the organization of the Shenango Steamship Company by the W. P. Snyder interests of Pittsburgh, Mr. Davock became manager of the Shenango boats. When the Shenango Company opened an office in Cleveland he was relieved of the active management but continued with the company as advisory manager.

SAMUEL H. CRAMP, a retired shipbuilder, son of William Cramp, founder of the William Cramp & Sons Ship & Engine Building Company, Philadelphia, Pa., died November 3, aged 79 years. He was admitted to membership in the firm in 1863, together with several other brothers, and aided materially in the success of the business, filling many executive positions. In 1897, when the business was transferred to the present owners, he was president of the company. He was prominent in philanthropic work, director of the Northern Trust Company, a member of the Union League and identified with many other organizations. He leaves a widow, a son and a daughter.

EDWARD P. BOTSFORD, secretary and treasurer Pittsburgh Malleable Iron Company, Pittsburgh, died October 30 at Denver, Col., after a long illness. He was a member of the Duquesne Club.

CAPT. DAVID DANTZLER PEDEN, president Peden Iron & Steel Company, Houston, Texas, since the incorporation of the company, died October 25, aged 77 years.

The Sons of Vulcan, composed of puddlers in the Pittsburgh and Central West districts, has elected officers as follows: John H. Dunn, Youngstown, Ohio, president; John Padden, Girard, vice-president; P. J. Durkin, Girard, Ohio, secretary and treasurer.

American Institute of Mining Engineers

(*Continued from page* 1099.)

Synopses of these papers and some account of the discussion on them will be given in a later issue.

Proposed Changes in Constitution

The whole of the Wednesday morning session was spent in discussing proposed changes to the constitution and by-laws. One of the important changes submitted comprehends combining the present two governing bodies into a single body of 24 members, divided into three groups of 8 each, the groups elected in successive years for three years each. Another provides for the establishment of a new class of members known as fellows and calculated to comprise members of the highest professional standing. This proposition came in for a good deal of criticism, adverse and otherwise, and it was finally voted as the sense of the meeting that the proposed article should not be submitted to the membership for a mail vote, although it remains for the committee to retain it in making its recommendations to the present governing bodies (the Board of Directors, in charge of the business affairs of the Institute, and the Council, in charge of its technical or professional affairs).

The committee making these recommendations is composed of Charles F. Rand, Charles Kirchhoff and Prof. Joseph W. Richards, appointed at the Institute's business meeting of October 7, which was adjourned to November 12, when the recommendations may be received. In the meantime C. R. Corning and George C. Stone had proposed changes with which the committee did not concur. For example, Mr. Corning favored retaining the present form of management, particularly because of the present difficulty of securing quorums to do business, which difficulty would not be met in the proposed arrangement.

"Fellows of the Institute"

One of the stipulations of the proposal to establish "fellows of the Institute" is that the fellows as a body may express their opinion on "pending or proposed legislation affecting the mining or metallurgical industries." Mr. Kirchhoff was inclined to believe that it was a doubtful arrangement in that the collective views of the fellows would after all be taken by the public as the views of the Institute as a whole, which ought not to take a position on legislation, which is practically always closely linked with politics. Captain Hunt was equally doubtful of the wisdom of granting such power to this proposed high grade of members and, indeed, was opposed to the whole idea. He suggested that the way to correct the errors of leniency of former times, in granting membership in the Institute, was through the admission of new qualified members. The feeling that the affairs of the Institute are concentrated in the hands of the few will not, he believed, be eradicated by the change. J. E. Johnson, Jr., asserted that the change would act as a deterrent to the activity of the younger men and that nothing should be fostered that savors of the exclusive. Among others who discussed the question were Henry D. Hibbard, who moved the elision of the proposed article; E. V. D'Invilliers, Philadelphia; H. Foster Bain, San Francisco; Philip N. Moore, St. Louis; Edward W. Parker, Washington, D. C.; Bradley Stoughton, New York City; A. R. Ledoux, New York City; E. G. Spilsbury, New York City; William Kelly, Vulcan, Mich., and Edward H. Benjamin, San Francisco. Mr. Parker suggested that instead of according to the fellows the privilege of expressing opinions on legislation, their special powers in this respect should be limited to "ethical and professional questions," but even with this limitation the idea of raising up the new grade was not favored by the majority at the meeting.

Another one of the proposed modifications provided that the secretary must devote his entire time to the affairs of the Institute, but this provision was not popular with the meeting. It appeared that many thought there should be no special restriction of this sort.

Mr. Corning, in explaining his stand against the proposed managing board of 24 members, argued for the present arrangement, but with heads of local sections on the Council and a secretary to each body and an editor, business manager and chairman of a reading committee of 10, this chairman to decide from the character of a submitted paper to whom of the committee it should be sent before being given to the business manager for publication. One may might perform one or more of these functions.

Another one of the proposals is to establish a junior grade of members.

The Constituents and Fluidity of Slag

Two important contributions to metallurgy in respect to the fluidity of slag were among the special features of the Cleveland meeting. One of these was by J. E. Johnson, Jr., on "The Effect of Alumina in Blast Furnace Slags," submitted on Tuesday afternoon, and the other was by Prof. Charles H. Fulton, Case School of Applied Science, Cleveland, on "The Constitution and Melting Points of a Series of Copper-Slags," presented on Thursday morning. They were both in the nature of introductory discussions, but were regarded as very important in turning investigation toward the study of conditions which must be met to secure suitable slag fluidity with minimum waste of heat. Prof. Fulton's work showed a variation in the melting point of the slag in relation to the degree of silicates, or indirectly, the proportion of lime present, and showed a curve of temperatures corresponding, for example, to the carbon-iron characteristic curves with a minimum or eutectic point. There was, however, a second curve of higher temperatures more or less arbitrarily chosen according to judgment or experience to indicate temperatures corresponding to desirable fluidity. In other words, fluidity demands a higher temperature than mere melting. The degree of silicates corresponding to minimum temperature for desired fluidity was not the same as corresponds to minimum melting temperature, although they lie close together.

The determination of the best combination of fluxing materials, it was pointed out, is important in minimizing the amount of heat wasted. The temperature of the melting point of a given slag when above the temperature of the eutectic point of that slag represents a possibly unnecessary waste of heat. Similarly the difference between the temperature of the melting point of a particular combination of minerals in a slag and the temperature of desirable fluidity of the slag represents a still greater waste of heat. This temperature difference is greater the nearer the degree of silicates in the slag approach bisilicates as distinguished from monosilicates. As the addition of alumina in a slag decreases the degree of silicate, a slag cannot be high in alumina and high in silicate at the same time.

Prof. Fulton emphasized that it would be desirable to study the question in relation to blast furnace slags, and that its importance lay in the physical properties of the minerals in composition. In reply to a question by Mr. Hibbard, Prof. Fulton added that iron silicates have generally a low melting temperature, and when the silicates are low, as in basic practice, the presence of manganese oxide tends to lower the temperature.

Another paper by Mr. Johnson aroused considerable interest. It dealt with the effect of high carbon on the quality of charcoal iron and discussed the white spotted center of Lake Superior pig iron. Instead of a gray center and white surrounding iron, the Lake Superior iron presented the anomalous condition of a white center surrounded by gray. He exhibited some thirty odd photomicrographs by means of the lantern and developed the point that the white charcoal iron was the dual result of pressure developed on the freezing and the existence of eutectic iron. Bradley Stoughton paid a tribute to the author for giving what confirms the theory that the spot is eutectic iron, though the possibility that it was due to pressure alone had been advanced by H. E. Field. He took issue with Mr. Johnson that bad cast iron may be made to lose its characteristics. Bad iron, he said, will remain bad right through from the cupola and it also gives bad steel.

Papers were read by title or briefly referred to owing to the lateness of the season, as follows: "The Development of the Reverberatory Furnace for Smelting Copper Ores," by E. P. Mathewson, Anaconda, Mont.; the process and chemistry of copper smelting at Anaconda, by Laist; conservation of national natural resources, by Dr. Rossiter W. Raymond and by George Otis Smith, director of the United States Geological Survey; "Notes on the Case Hardening of Special Steels," by Prof. Albert Sauveur and G. A. Reinhardt, Harvard University, and "Recent Developments in Open-Hearth Steel Practice," by N. E. Maccallum, superintendent steel plant, Phœnix Iron Com-

pany, Phœnixville, Pa. The last paper was devoted in a large part to the bifurcated spout for pouring a large furnace at Phœnixville, which was illustrated in these pages some time ago.

The Dinner

A subscription banquet was held Wednesday evening at the Statler Hotel. It was well attended and a large percentage of the diners were ladies. David T. Croxton, general manager Cleveland Furnace Company, Cleveland, served admirably as toastmaster. He had a long list of introductions to make, as the list of speakers included the following: Captain Hunt, William G. Mather, president Cleveland-Cliffs Iron Company, Cleveland; Philip N. Moore, St. Louis; Dr. Edward W. Parker; Edward H. Benjamin, San Francisco; William Kelly, general manager Penn Iron Mining Company, Vulcan, Mich.; Prof. James F. Kemp, president of the Institute; Samuel T. Wellman, Cleveland, and Charles Kirchhoff.

Mr. Mather touched on the problems and magnitude of iron mining. He mentioned the probability of an ore movement this year from the Lake Superior regions of 45,000,000 tons. In 1878 the quantity mined was 1,000,000 tons and there were no chemists or engineers employed; now one would not dare to take a step without the engineer or chemist. His company goes back to beginnings, having been organized in 1849. He mentioned at length the housing and sanitation at the present time, the statistics of accidents, and described briefly the school of instruction now in operation for mine bosses and others. Mr. Kelly spoke at some length of what the new types of drilling machines are doing. Mr. Wellman paid a tribute to two absentees, Dr. Raymond and John Fritz, and told how Sir Henry Bessemer convinced him that it was the good fortune of having the right character of iron put into the converter at the crucial moment that made it commercially practicable. Mr. Kirchhoff offered in what he said was the spirit of the times a proposal of rejuvenation for the institute, another amendment to the constitution, No. XXIII, and his listeners, brought to a state of high expectancy as he gravely brought the document from his pocket, learned that hereafter in similar functions the wife, daughter, friend or present or future sweetheart must follow each speaker, provided that the last word be given to mere man.

Some October Records

In October furnace A of the Youngstown Sheet & Tube Company, Youngstown, Ohio, made 15,627 gross tons of Bessemer iron; furnace B, 16,273 tons, and furnace C, 16,354 tons—a total of 48,254 tons, or an average per day, per furnace, of 519 gross tons. In the Bessemer steel department the converting mill, which is equipped with two 10-ton converters, made 72,875 gross tons of ingots and the blooming mill made 63,158 tons. These outputs establish new records for this plant.

All records for output at the Ohio works of the Carnegie Steel Company and at the Upper and Lower Union mills at Youngstown, Ohio, were broken in October. No less than 43 new records for output were made in October at these plants, and three new records were made at the Greenville, Pa., works.

The Carnegie Steel Company is now operating 51 out of its 58 blast furnaces in the Pittsburgh, Wheeling and Valley districts. The idle stacks are one Edgar Thomson, one Lucy (which went out November 2 for repairs), one Mingo, and Zanesville, Steubenville, Edith and Neville, which have been idle for over five years. One Bellaire was blown in November 1, and one Ohio stack at Youngstown, after being relined and repaired, was blown in November 5.

The various makers of iron bars, muck and scrap bars, skelp, etc., in the Schuylkill Valley district, have advanced the wages of puddlers and scrappers from $4.50 to $4.75 per ton. Announcements to this effect, operative November 1, have been made by the American Iron & Steel Mfg. Company, Lebanon and Reading, Pa.; E. & G. Brooke Iron Company, Birdsboro, Pa.; George B. Lessig Company, Pottstown, Pa., and others.

The Forged Steel Wheel Company Expands

The Forged Steel Wheel Company of Pittsburgh, an identified interest of the Standard Steel Car Company, will place contracts in a short time for the building of a large merchant mill at Butler, Pa., where the company operates an open hearth steel plant and car wheel works. The building will be erected by the McClintic-Marshall Construction Company and will take about 2000 tons of steel. Several years ago the Forged Steel Wheel Company built an open hearth steel plant at Butler containing six 60-ton furnaces, which turns out slabs for its steel wheels, selling its surplus steel in the open market in the form of billets and slabs. Recently the company sold 10,000 tons of open hearth billets to the National Tube Company for delivery at its McKeesport, Pa., Works, shipments still being made on this contract.

New Publication

Mechanical World Pocket Diary and Year Book, 1913. Cloth; size, 4 x 6½ in.; pages, 439; illustrated. Published by Emmott & Co., Ltd., Manchester, England. Price, 6d. net.

This little book, now in its twenty-sixth year of publication, is a collection of useful engineering notes, rules, tables and data with chapters giving special attention to steam engineering, including turbines, boilers, condensers, the steam engine indicator, etc.; gas and oil engines, suction gas producers; also descriptive matter and handy rules and formulae pertaining to heat, chain driving, hydraulics, gearing and other subjects too numerous to mention. As the name implies, a diary for 1913 is included.

The furnaces at the new plant of the Gary Screw & Bolt Company, Gary, Ind., are all oil burning. In the manufacture of such materials as rivets and bolts, where a continuous soaking heat is not required, but where there is an opportunity for offsetting an increase in fuel cost with an increase in product, oil may still be used to advantage, even at higher prices, if it is obtainable at all. If the supply is entirely cut off, however, a change to gas for these furnaces will be necessary and this change, in most cases, will not only involve a change of burners and connections, but, as most gases burn with a non-luminous flame, as compared with the luminous flame of oil burners, changes will also be needed in the brick work to provide impinging surfaces for the flame.

Experiments are being conducted at Louisville, Ky., with a view to ascertaining whether engines of the type designed for the use of fuel can be successfully used with crude oil, which can be had in great quantity in Kentucky and Tennessee. The owner of a 25-hp. engine in southern Kentucky is said to have been using crude oil for some time as fuel. In starting the engine gasoline is used for the purpose of heating the crude oil.

City Water Commissioner E. E. Wall, of St. Louis, has presented to the Board of Public Improvements an exhaustive report recommending preparation for the construction of an entirely new water-works plant at a cost of $12,000,000, to be fitted to supply the city's needs until 1960, and also the increase of the capacity of the present plant to a total of 150,000,000 gal. of water per day.

The Chicago Steel Foundry Company, Chicago, Ill., in whose new foundry the operation of the one-ton Tropenas converter has been markedly successful, has ordered a second converter of two tons capacity. New equipment has also been ordered for the foundry cleaning room sufficient to provide finishing capacity for 18 tons daily.

The date at which fuel oil service will be discontinued by the Standard Oil Company of Indiana varies with each customer, some interests having fuel oil contracts which do not expire until the latter part of 1913.

The Fulton Bag & Cotton Mills, Atlanta, Ga., is investigating different smoke prevention devices, and would doubtless welcome information from manufacturers of this class of apparatus.

Effect of Alumina in Blast Furnace Slags*

Free-Running Temperature the Important Point of Slag—Effect of Lime and Magnesia Considered—Desulphurization with High Alumina

BY J. E. JOHNSON, JR.†

The subject of blast-furnace slag is one which has had much consideration, particularly from the scientific standpoint, and several years ago technical literature contained many learned discussions on the oxygen ratio of the acids and the bases, all on the assumption that acids and bases must be present in a ratio depending on molecular weight and chemical valency. Much work has also been done, sometimes in conjunction with the former, on the total heat and the temperature of initial fusion or softening of various slags. A wider knowledge of the blast furnace now enables us to say that for practical purposes this work has been of almost no value.

Free-Running Temperature the Important Point of Slag

It is now generally admitted that on the physical side the important point of a given slag is neither its total heat of fusion nor its softening point, but its free-running temperature, since this is the critical temperature of the furnace. This temperature bears no definite relation to the softening temperature, as determined by Seger cones, for instance, because some slags melt relatively like ice, with a very short viscous range, while others melt relatively like tar, with a very long viscous range.

In one the difference between the softening and the free-running temperature may be very small, as little as 100 deg. F., while in another this difference may easily be 200 or 300 deg.

The importance of this difference is so great in practice as to destroy completely the value of exhaustive investigations, even such as those of O. Boudouard, published a few years ago.§

When we come to the chemical side of the question we may as well dismiss the obscuration which comes from the introduction of oxygen ratios and other abstruse theoretical considerations, and admit frankly that experiment on the furnace itself is the only safe foundation for practice or for a useful theory. I am moved to lay stress on this point because in years past I was greatly puzzled and befogged by some of the older school of furnacemen, who emphasized the mysterious nature and difficulty of making slag calculations, the fact being that, given the materials to be used and the slag to be produced, the college student who could not be taught in a day to make the calculations would have a poor chance of ultimate usefulness. The omission or concealment of the fact that the slag to be produced was known only by experiment and experience with the furnace itself caused my mystification, and I therefore emphasize it here.

Object Sought in Ascertaining a Desired Slag

The object to be sought may be briefly stated as follows: Given the materials to be used and the kind of iron to be made, to ascertain the slag which will produce the result with the least cost for coke and for flux, and will permit the greatest output. The three desiderata come in the order given.

We may in this discussion omit consideration of charcoal practice because the slag question is of minimum importance in that field, and the field itself is of minimum importance in the iron industry; also because of my complete ignorance of that practice.

(This paper was written three years ago, but has remained unpublished until now. It so happens that in the interval I have had extensive experience with charcoal-iron slags, but it is not considered desirable to introduce a consideration of that subject into this paper, because, in the absence of the necessity for desulphurization, the problems offered by charcoal slags are totally different from those of coke slags. In a general way, however, it may not be amiss to state that observation of charcoal slags has confirmed the position taken in this paper.)

Coming then to normal coke practice and remembering that generally the lowest fuel consumption is obtained with the lowest critical temperature, the object desired may be stated more definitely as the production of the most fusible slag that will give the necessary desulphurization of the iron. This statement is perhaps subject to certain limitations from the fact that there are circumstances in which it is necessary to raise the critical temperature in order to enable the iron to absorb a large quantity of silicon. The extent of this limitation I am not able to state, but we will return to this subject later.

The Effect of Lime

It is necessary to remember that while the effect of lime is to increase the basicity of slag and facilitate the removal of sulphur, its use is subject to grave limitations, for two reasons:

1. The lime being generally the major ingredient of the slag, to increase the percentage of the lime in the slag involves a more than proportional increase in the slag volume; for instance, to increase the percentage from 50 to 55 requires an increase of more than 10 per cent. of the weight of the slag in the lime, or about twice as much in limestone.

2 (and much more important). The addition of lime raises the fusion point of the slag very rapidly.

The desulphurizing effect of the slag is proportional, not only to its basicity, but also to its fluidity in an almost equal degree, so that while increased lime *per se* has a desulphurizing influence, this is, to an increasing extent, neutralized and finally reversed completely by its decreased physical activity.

This is well shown in basic practice, in which the highest sulphur iron is made, not with deficient lime, but with an excess (due to a change in ore or the like) so great that the heat available is unable to bring the very refractory slag to the free-running condition.

In further illustration of the point, there are two distinct methods of making this kind of iron. The first consists in running on a very calcareous slag, with which the silicon in the iron is kept down by the basicity of the slag in spite of the high temperature necessary to keep the latter fluid. The second consists in maintaining a slag of only moderate basicity and much lower fusion temperature and keeping down the silicon by carrying a heavy ore burden, which, of course, can easily be done with the lower critical temperature. Furnaces running on the first plan always require more coke for basic than for foundry iron, while those running on the second plan use less than for foundry iron.

It seems to me practically certain, therefore, that there is a considerable range of lime content in the slag for given conditions, in which the desulphurization of the iron is not appreciably affected, while the coke consumption necessarily rises with the increase in the fusion tem-

---

*Presented at the Cleveland meeting of the American Institute of Mining Engineers, October 29, 1912; also at the joint meeting of the Institute with Section IIIa, Metallurgy and Mining, of the Eighth International Congress of Applied Chemistry, New York, September, 1912.

†Superintendent Ashland Iron & Steel Company, Ashland, Wis.

§It may not be amiss at this point to call attention to the excellent suggestion of Woolsey McA. Johnson, made several years ago, for determining the temperature at which different slags have the same practical fusibility. This suggestion was briefly to make experiments in a small electrically-heated furnace, the bottom of which was a carbon slab with a small round hole through it. The temperature at which different slags would flow through this hole would furnish accurate information as to their relative practical fusibility. To determine the proper size of the hole through the carbon block, I offer the further suggestion that the temperature of the slag flowing over the cinder dam in standard furnace practice be taken when the slag was about of normal composition. Then put some of this slag in the experimental furnace and heat it to the temperature observed. A few trials would determine the size of the hole through which it would flow at this temperature. This size of hole could then be used in future experiments with the certainty of obtaining results comparable with actual practice. Investigations along these lines would be of real interest and value to furnacemen.

perature consequent on the higher lime ratio, as well as the increased slag volume.

In the case of foundry iron, the increase of lime may be positively detrimental because of the reduction of silicon in the iron. I have recently been informed of several cases in which the lime had habitually been carried too high, because this action was not understood. These cases of bad furnace operation show the importance of this subject.

The Effect of Magnesia

In all theoretical slag calculations the quantity of magnesia is multiplied by 1.4 to put it on the same basis as the lime, which, from the point of view of the oxygen ratio and molecular weights, is perfectly correct. Practically, however, this does not work out. Furnacemen using a limestone with a variable content of magnesia have told me that careful observation had failed to show any difference whatever on the furnace whether the magnesia was high or low, and I have seen a furnace using half calcite and half dolomite, the calcite being relatively impure and the dolomite very pure, put on all dolomite, which should have made the slag excessively basic, on the basis of molecular weight, but which as a matter of fact showed no observable change. The truth seems to be that magnesia is less active chemically than lime in about the same proportion that its molecular weight is less.

An interesting proof of its small chemical activity is supplied by the manufacture of caustic soda from the carbonate. Quicklime is added to the carbonate solution and takes up the carbon dioxide from the soda; for this purpose magnesia is found to be perfectly inert and worthless. Sir Lowthian Bell's opinion that magnesia was so inert as to be useless for the removal of sulphur in the blast furnace is well known, but this opinion is no more borne out by practice than that giving it a greater value than lime, the truth appearing to be that for furnace purposes, in all ordinary proportions, one is about as effective as the other. It is very necessary, however, to recognize that the addition of a certain amount of magnesia has a marked effect in lowering the fusion temperature of the slag, and is therefore of great use where calcareous slags are required, particularly in the manufacture of basic iron.

For practical purposes lime and magnesia may be considered as being of equal value, and hereafter in this paper "lime" will be used to mean the sum of lime and magnesia.

The Effect of Alumina

The foregoing portion of this paper contains nothing essentially new and is intended as an introduction to the remaining portion, the substance of which seems to have been unknown to most of the furnacemen with whom I have discussed the subject.

The effect of alumina has been the subject of much discussion; some regard it as an acid, others as a base, while a few declare it can be made to act as a base or an acid almost at will. It has seemed to me that under such circumstances the probability was that its action was neither acid or basic, but was perfectly neutral, simply a diluent affecting the viscosity of the slag to some extent, but, with a given ratio of lime to silica, not affecting its chemical nature at all.*

For several years the range of alumina in slag of which I had knowledge was so limited that I could not prove this contention, but very recently a furnaceman gave me complete information of a remarkable series of experiments he had carried out, in which the alumina in the slag had been as high as 39.5 per cent., with silica as low as 21 per cent. on individual flushes, and averaging for an entire day SiO_2, 24.7; Al_2O_3, 36.0 per cent. The iron made was good Bessemer iron, about 2 per cent. of silicon, with sulphur about 0.023 per cent. With this let us compare standard Lake ore practice, on basic iron, running about Al_2O_3, 13.5; SiO_2, 33 per cent.; and Virginia practice on the same iron, Al_2O_3, 6.5; SiO_2, 36 per cent.

It is unfortunate that the experimental run was on Bessemer instead of basic iron. The records of other days which show basic iron made are not so complete, but they indicate only a small difference in the slag; that shown, of course, being an increase in lime. The coke consumption of this slag was not materially different from what it was in standard practice; the slags were free flowing, and did not have a noticeably higher fusion temperature than ordinary.

Here, then, we have three cases, in all of which the coke is of about the same sulphur content, the desulphurization of the iron is the same, the coke consumption is no more different than would be accounted for by the different kinds of ore. The only difference of importance is the silicon in the iron, which is not sufficient to require a very great change in the slag composition. We will refer to this condition later.

The amount of lime in these slags can be calculated, but it is necessary to remember that there is a small quantity of neutral material, CaS, FeO, MnO, etc., which may be taken at 3.5 per cent. in all cases as a close approximation to good practice. Following this procedure, the results shown in the first four columns of Table I are obtained:

Table I.—Composition of Slags

	1	2	3	4	5	6	7
	Al_2O_3 Per cent.	SiO_2 Per cent.	CaO by Difference Per cent.	Neutral Substances Per cent	Ratio $\frac{CaO}{Al_2O_3+SiO_2}$	Ratio $\frac{CaO+Al_2O_3}{SiO_2}$	Ratio $\frac{CaO}{SiO_2}$
Virginia practice.	6.5	36.0	54.0	3.5	1.27	1.68	1.50
Lake-ore practice.	13.5	33.0	50.0	3.5	1.08	1.92	1.51
Special experiment	36.0	24.7	36.8	3.5	0.59	2.90	1.44

Columns 5 and 6 present the ratios of lime to silica + alumina, and lime + alumina to silica. These ratios change from 1.27 to 0.59 in the first case, and from 1.68 to 2.90 in the second case. No one can hope to show any relations between these ratios that can bear in any intelligible way on the variation of the alumina content.

THE LIME-SILICA RATIO A CONSTANT

Column 7, however, shows the ratio of the lime to the silica, which is virtually a constant throughout. The result in the experiment is the lowest, and corresponds to the higher silicon in the iron. If the lime were increased in this latter case about 5 per cent. of its own weight, this slag would then have identically the same ratio as the others, and would be just about as much "limier" as would permit the production of basic iron by the addition of a little more burden.

It may be claimed in opposition that the analyses chosen as representative of Virginia and Lake ore practice have been taken with the object of showing the result desired rather than representing the typical slags. For the Virginia practice this certainly is not true, and if there be any error in the slag analysis for Lake ore, I do not know how to better it. Certainly no correction that could be made would fail to leave the lime-silica ratio infinitely nearer a constant than either of the others.

It may be well to reiterate here that such a comparison is only useful in the case of furnaces on a comparable basis in other respects; that is to say, working for the same degree of desulphurization and the same silicon, and using materials of about the same sulphur content.

The question of the slag volume also enters here, and the question whether a given slag volume is as efficacious in the removal of sulphur when the alumina is high as when it is low. We know that if the slag exceeds a certain content of sulphur in ordinary practice, the desulphurization of the iron will be incomplete, and if the alumina be simply a diluent the effectiveness of the slag might be diminished in proportion as the percentage of the alumina rose.

SATISFACTORY DESULPHURIZATION

In spite of this theoretical consideration, the sulphur in the slags in the high-alumina experiments mentioned ran about 1.75 per cent., with perfectly satisfactory desulphurization, while the relative slag volume was little, if any, higher with alumina approaching 40 per cent. than with normal alumina.

*This conception of a given constituent affecting the physical but not the chemical properties of slag, in which two kinds of properties are so closely interwoven, is difficult at first sight, but I have illustrated it for myself as follows: If we had an ordinary acid, such as hydrochloric acid, in one beaker, and a solution of caustic alkali in another, we could mix the two in any proportions and each addition of one or the other would correspond to the change in the acidity or basicity of the resultant solution, but if we added a considerable quantity of molasses we should alter its viscosity and its "free-running temperature," without affecting its chemical properties in any way. The illustration is a homely one, but in my opinion the case is precisely parallel to that of slags.

On foundry irons the ratio of lime to silica is, of course, lower than on basic. In Virginia practice the typical analysis would be about: Al_2O_3, 7; SiO_2, 41; CaO, 48.5; neutral substances, 3.5 per cent., giving a lime-silica ratio of 1.2 instead of 1.5 on basic iron. A recent opportunity of discussing this subject with many furnacemen in all parts of the country has shown that virtually all slags for foundry iron have a lime-silica ratio of between 1.2 and 1.4. Foundry-iron practice is so much less definite than basic that the same exactness of ratio is hardly to be expected, and data are not at hand to determine a correct ratio definitely.

There seems to be a fairly well-defined opinion among the best informed furnacemen that alumina has the effect of making the slag viscous and stringy in a certain range, beginning about 16, reaching a maximum about 20, and disappearing between 25 and 30 per cent. The data at hand do not permit of a definite statement on the subject, because the lime-silica ratio is not known for a sufficient number of cases, and if high alumina be coupled with a higher than normal lime-silica ratio, it is not fair to blame the alumina any more than the high lime for the result.

HIGH ALUMINA WITH HIGH-SULPHUR COKE PRODUCES BAD RESULTS

One case is on record in which the high alumina was coupled with excessively bad results, but it was also coupled with an extremely high-sulphur coke, which compelled the use of very high lime, which resulted in an infusible slag. In such a case the high alumina may do no more than render stringy a slag that would be troublesome in any event. A question of this character can only be properly settled by the use of an accurate pyrometer for determining the temperature at which different slags become free running. The perfection of an accurate optical pyrometer which can easily be used to determine the temperature of the slag close to the furnace would make the investigation relatively easy.

The utility of such knowledge lies in enabling us to determine in advance the slag which will give satisfactory results in practice when a change in the materials used causes the alumina to exceed the ordinary limits. The decreasing grade of the ores available must result in the increasing use of many ores higher in alumina than those of present practice. If the laws governing its action are not known, bad results are bound to follow.

A furnaceman recently told me of a case in which the alumina had been regarded as an acid, and the slag had been calculated to give the same ratio of lime to silica + alumina as in standard practice, with the result that the furnace had been badly "bunged up" with lime.

Several furnacemen with whom I have talked had realized that alumina could not be properly regarded in this way, but only two have made definite statements that they regarded it as a neutral substance, and only one had reached the conclusion that a definite lime-silica ratio was the object to be attained. This was J. H. Frantz, general manager Columbus Iron & Steel Company, whom I first met when this article was almost complete. Several years ago he had reached the opinion here maintained, and had prepared a table giving a lime-silica ratio of 1.5 with percentages of alumina varying from 8 to 30 per cent. He also told me that this view had been published several years ago, but he did not remember the name of the publication or of the author.

The fact that this publication as well as the principle seems to be entirely unknown to most furnacemen and the increased importance attributed to the free-running temperature of the slag in recent years are the only excuse for the present paper, in the face of prior publication of similar matter.

INCREASED VISCOSITY OF BENEFIT IN MAKING FOUNDRY IRON

In conclusion, it seems worth while to point out that the increased viscosity accompanying high alumina may be of benefit in making foundry iron. This was a subject to which both Mr. Frantz and I independently had given some consideration for several years. That iron will not take up much silicon except at a relatively high temperature is well known, and as its melting temperature is relatively low, its tendency is to run down out of the region in which it can absorb silicon into the crucible.

The fusion temperature of slag is much higher than that of iron, and, being more viscous, it acts as a retardant on the iron and always delays its descent so that it can acquire the necessary temperature.

A too fusible slag does not perform this function properly, and I have personally seen a case in which no reasonable reduction of burden would raise the silicon to ordinary foundry limits, but in which this was easily done by increasing the lime considerably beyond that necessary for desulphurization in spite of the desiliconizing influence of the more basic slag. For the same reason it is more difficult to make foundry iron when enough magnesia is present to increase the fluidity of the slag. Now if alumina increases the viscosity of the slag without the accompanying desiliconizing influence of the limier slags of the same free-running temperature, then the introduction of the silicon into the iron should be facilitated by high alumina. Mr. Frantz is of the opinion that this is true to some extent. My own experience does not cover the point.

Canada's Steel Makers Ask Adequate Protection

TORONTO, November 4, 1912.—Last week the Canadian Finance Minister and the Canadian Minister of Customs, representing the Government, received a deputation of steel manufacturers at Ottawa, who presented a memorial calling for increased protection of their industry. The deputation included J. H. Plummer and Hector McInnes of Halifax, representing the Dominion Steel Corporation; T. J. Drummond, president Algoma Steel Company; Thomas Cantley and John Irvine, representing the Nova Scotia Steel & Coal Company, and Robert Hobson, representing the Steel Company of Canada. Sir Donald Mann, vice-president Canadian Northern Railway, was also in the city in support of the deputation on behalf of the MacKenzie & Mann blast furnace interests.

The memorial presented to the Government noted that the protection afforded the iron and steel industries, consequent upon the abolition of the bounties, was not quite adequate to enable them to hold the business they had hitherto had under the assistance of the bounties. Wire rods, for instance, were entirely unprotected and the industry was thus in an anomalous position as compared with practically all other industries in Canada. It was also urged that iron and steel men had now little protection against the dumping of large quantities of iron and steel from the United States in Canada at or below the American cost of production. The general argument of the deputation was summed up as follows:

As to the view which the community may take, if it is proposed to relieve one special trade from the disadvantages under which it labors, while others with a similar claim to consideration are untouched, we would respectfully urge that the establishment on a sound footing of the great basic industries of iron and steelmaking is universally regarded as one of the primary needs of the country and has been so considered by Parliament for the past 25 years. We are of the opinion that the lowering of duties on iron and steel which was made possible, or at any rate rendered less injurious by reason of the bounties, the continuance of these duties at the lower rate when the bounties are gone and the consequent inadequacy of protection afforded to these industries need only be made known to secure full support for any reasonable remedy from all who desire to see Canada prosper. We respectfully submit that the position of this industry in respect to the tariff and the competition to which it is exposed from countries laboring under great depression in the iron and steel trades justify us in asking special and immediate consideration from the Government. The iron and steel industries of Canada have suffered during the whole of the past year under the inadequate protection above referred to and, unless some form of relief is given, it must continue to suffer so that the development of the industry will be seriously retarded.

Interviewed after the deputation had finished its conference, Mr. Plummer said:

We do not ask for high protection. We simply ask for a leveling of the duties where the Government and its experts think they can reasonably stand it. We claim to be one of the most important industries of the Dominion, and yet we enjoy a far lower protection than the average enjoyed by other Canadian manufacturers. For instance, while the output of our mills has a protection varying from 7½ to 20 per cent., a large number of manufactures constructed from our steel are protected as high as 35 per cent. in some cases. We simply want the tariff arranged according to some reasonable principle so that we may be in a position to go on and develop our business and extend our plants.

The Ministers promised that the memorial would receive the Government's careful consideration. C. A. C. J.

Crucible Steel Company of America

Annual Report for the Fiscal Year Ended August 31, 1912

The twelfth annual report of the Crucible Steel Company of America, Pittsburgh, presents the following comparative profit and loss account:

	1911-12	1910-11
Gross sales	$19,256,106.93	$15,902,139.00
Operating charges:		
Manufacturing cost	$12,620,719.21	$10,572,038.83
Repairs and maintenance	786,419.71	719,031.76
Administrative and general expenses	320,167.54	303,714.32
Selling expenses	953,019.34	829,422.06
Taxes	124,781.45	182,234.94
Commercial discounts and interest	185,677.53	122,580.70
Total of above deductions	$14,990,784.78	$12,675,022.61
Provision for depreciation	650,000.00	599,473.46
Provision for contingencies	5,863.99	32,504.57
Net manufacturing income	$3,609,458.16	$2,595,138.36
Other income	62,215.83	134,627.87
Total net income	$3,671,673.99	$2,729,766.23
Interest:		
Dividend scrip	73,309.50	73,309.50
Bonds of associated companies	173,368.14	98,938.38
Net profits applicable to dividends	$3,424,996.35	$2,557,518.35
Cash dividends on preferred stock	1,750,000.00	1,730,277.50
Undivided earnings for the year	$1,674,996.35	$827,240.85
Add previous surplus	3,275,280.40	2,448,039.55
Total undivided surplus as per balance sheet	$4,950,276.75	$3,275,280.40

The balance sheet, as of August 31, 1912, is as follows:

Assets

Real estate, plant, good will, etc	$45,253,247.93
Investments in and construction advances to associated companies	3,673,969.67
Inventories of raw materials, manufactured products and stores	6,469,678.09
Taxes and insurance, unexpired, etc	52,044.79
Investments, bonds and stocks	200,100.00
Bills receivable	72,665.09
Accounts receivable from customers and associated companies (less reserve)	3,358,725.60
Cash in banks and on hand	1,298,181.47
Total	$60,378,612.64

Liabilities

Preferred stock		$25,000,000.00
Common stock		24,578,400.00
Dividend scrip due June 30, 1920, less held in treasury		2,161,210.00
Bills payable		1,262,500.00
Accounts payable		1,497,547.93
Interest and taxes accrued		74,400.78
Reserve funds for depreciation and renewal of plants (unexpended balance)		621,718.31
Fire insurance		182,558.87
Contingent		50,000.00
Surplus:		
Net profits for year ended August 31, 1912	$3,424,996.35	
Deduct cash dividends on preferred stock Nos. 32 to 35	1,750,000.00	
Surplus for the year	$1,674,996.35	
Add surplus as of August 31, 1911	3,275,280.40	
Undivided surplus August 31, 1912		4,950,276.75
Total		$60,378,612.64

The Crucible Steel Company of America has guaranteed the principal and interest of $7,940,000.00 five per cent. bonds of associated companies.

August 31, 1912, the unpaid dividends accumulated on the preferred stock aggregated 17¾ per cent., of which 1¾ per cent. was paid October 1, 1912.

From the accompanying statement signed by Chairman Herbert Du Puy and President C. C. Ramsey the following extracts are taken:

In July, 1912, almost at the end of the fiscal year, conditions throughout the country changed for the better, and this company, too, began to receive the benefit. The demand throughout the country for the products of steel works has become so urgent that it has been impossible to secure the additional labor necessary to produce the business offered. All of our mills are short of this class of labor, such handicap largely affecting increase of profits, since, with the reduced tonnage, costs are naturally increased. It is hoped that, after cold weather sets in, conditions in this respect will improve.

An effort is being made to bring up and to maintain the plants to the highest state of efficiency. To accomplish this $786,419.71 has been expended for maintenance and upkeep in the past year, all of which has been charged against income as a part of current expenses. In addition, the board of directors has set aside, out of profits, the usual sum of $500,000 to cover depreciation and renewal of plants of the parent company, and an additional $150,000 for the subsidiary companies.

The plant of the Pittsburgh Crucible Steel Company has been steadily growing through the construction of its buildings and the erection of machinery by various contractors. Unfortunately, owing to the heavy demands on the contractors for other construction work, our work has not progressed as rapidly as was expected, so that the plant will hardly be able to produce steel until some time in the coming year, probably not until the spring or summer of 1913.

Owing to the expected large increase in the number of employees at the plant of the Pittsburgh Crucible Steel Company at Midland, Pa., it at once became apparent there was an insufficient number of houses in the town to take care of this large prospective influx. This company therefore incorporated a new constituent company, to be known as the Midland Improvement Company. Through it has been acquired the remaining 500 acres of unimproved land in and adjoining the town. It is the intention to divide this property into lots, some of which will be sold to employees, and on others houses for workmen will be erected. To modernize the improvement, it was decided that a large portion of this new purchase should be laid out as a model town, following in a general way the development of some of the workingmen's settlements in England and Germany, where the streets are laid out in curves, with parks and recreation grounds at intervals, planned to make the most attractive place for the establishment of workmen's homes and for the rearing of their families. All houses the company builds will be most modern in construction, having the best improvements, keeping in mind the desire to uplift the whole moral tone of the wage-earner.

The Crucible Coal Company, organized by this company last year, began the delivery of coal to two of our plants in August, 1912. It is fully expected that gradually all the large plants of the company will be supplied with fuel from this source.

The plans for the Atha works outlined in our report last year have been slowly focusing to completion, so that it is confidently expected that some time in the spring of 1913 the electric-steel plant will start actively at work. The machine shop and auxiliary buildings have been increased in size, so that the company can now take care of an additional amount of Government business.

This company has organized at Syracuse, N. Y., a new corporation known as the Syracuse Crucible Steel Company. This corporation has bought some 45 acres in the suburbs, upon which it is intended to begin the erection, the coming year, of a large, new crucible steel plant, planned to use the most economical appliances and to manufacture the highest quality of crucible steels by the most modern methods. It has been found necessary to enter into this new construction owing to the restricted location of the present Sanderson plant, it being in the heart of Syracuse, with no possible way to enlarge it.

Up to the close of last week more than 3000 Greeks, Bulgarians and Servians employed in the steel mills and other allied interests in East St. Louis, Granite City, Madison, Edwardsville and other Illinois towns near St. Louis had left work and taken passage for Europe to participate in the Balkan war. The result has been serious interference with the operations of the Commonwealth Steel Company, Granite City Steel Company, American Steel Foundries, American Car & Foundry Company and other manufacturers. The departure of so much unskilled labor has compelled much of the skilled labor to lay off until the vacancies in the common labor ranks can be filled.

A new company is being organized and is reported to be practically assured, to reopen the Tudor plant of the Republic Iron & Steel Company at East St. Louis, Ill., as an independent proposition. It is being promoted by Thomas Cunningham, former superintendent of the plant; H. C. Large, his former assistant, and Henry D. Sexton, a capitalist of East St. Louis. The Republic Company had ordered the dismantling of the plant, but has held up these instructions pending action on the new development.

Thorough Observations in Boiler Testing

How Shortcomings in Boiler Settings, Combustion, Etc., May Be Discovered—A Basis for Rates of Combustion - A Heat Balance

BY ALBERT A. CARY

How frequently we find the reports of furnace and boiler tests so incomplete that the information we are desirous to obtain is completely inaccessible. I have so often examined test reports, wishing to learn the value of some new or interesting feature which is included in the equipment, only to find the very observations which would give me this information are either omitted or else some inconsistency appears which makes me drop my investigation, no wiser than when I started. Lack of ability, inertness on the part of the conductor of the test or want of good faith in reporting results leads to the suppression of much valuable data which should be included in the test report to make it satisfactorily complete.

The object of the test should be distinctly stated, which statement will lead us to look for a very complete set of observations, giving us all possible information relating to the part which is being specially investigated. While the remaining observations which are made may not be so complete as these relating to this special part, they should be sufficiently complete to show the related effect of the specially investigated part to the remainder of the equipment. Where a statement of the object of the test is omitted we may generally look for an aimless test, incomplete and unsatisfactory.

A complete description of the furnace and boiler and the various apparatus used in the test is very essential, including all of the principal dimensions, and I usually include with my reports a drawing of both boiler and furnace such as shown in Fig. 12.

The descriptive data included in the report of the test of this boiler were as follows:

Dimensions and Proportions.

Type of boiler	Horizontal return tubular
Diameter of shell	60 in.
Length of shell (inside)	18 ft.
Number of tubes	36
Diameter of tubes (outside)	4½ in.
Diameter of tubes (inside)	4.252 in.
Length of tubes (over beading)	18 ft. 1⅛ in.
Diameter of steam dome	30 in.
Hight of steam dome	44 in.
Kind of grate	Reagan standard shaking grate
Percentage of air opening	41 per cent.
Grate surface	5 ft. wide, 6 ft. long; area, 30 sq. ft.
Hight of furnace, from flat grates to bottom of boiler shell:	
At front end	20 in.
At rear end	27 in.
Heating surface of boiler	925 sq. ft.
Rates of heating surface to grate surface	30.84 : 1

Knowledge of the Boiler Setting

For one experienced in the design of boiler and furnace settings, such data and especially the scale drawing, are of the greatest interest. We all appreciate that what is known as an anthracite setting is not adapted to the use of bituminous coal and we would not think of using a setting such as is used for western bituminous coal for anthracite fires. The question naturally arising to the experienced engineer, when he examines a boiler test, is whether or not the setting is properly adapted to burn the kind of fuel that was used.

When a bituminous coal is charged upon a hot fire bed, the first thing that occurs, as soon as the new charge is heated, is the driving off of the volatile gases held in the coal. These gases rise into the combustion chamber where they are burned, while the fixed carbon (practically) alone is burned on the grates.

Thus when we have a coal with practically all of its combustible matter fixed carbon, like the hard anthracites, we need plenty of grate surface and a comparatively small combustion chamber. But when a very large percentage of the combustible part of the coal is volatile matter we require a much smaller grate to burn the fixed carbon remaining on the grates after the gaseous matter is "distilled off" and this combustible volatile matter needs a very much larger combustion chamber to mix with the air supply and burn.

There are also many curious ideas introduced into settings by masons who are left to their own devices when setting boilers, and all such innovations should be carefully noted in the test report so that the investigator may judge as to whether the furnace and boiler were given a fair chance in their course of operation. An improper setting often leads to poor results, and such being the case the test report is incomplete without a full and complete description of the setting.

Pressure and Temperature Readings

In the report of pressures observed, care should be taken to give correct readings. In the majority of the equipments I have tested I have found the steam gauges at the plant in error. This has led me always to use my own test gauges, which are calibrated before and after the test. Many gauges will be found improperly connected, some having the hot steam contained in their Bourdon tubes and in one case, where a very high boiler was installed, I found that the steam gauge had been lowered by the engineer of the plant, to facilitate readings, so that there was a column of 30 in. of water above the gauge.

Draft readings are frequently taken in the flue back of the damper instead of between the boiler and the damper.

Temperature readings are often reported in error, due to causes I have already named. These are too important to receive anything but the greatest possible care and the reported results should be made after a careful calibration of all temperature indicating apparatus. These observations should be as complete as possible.

In reporting the test of the boiler illustrated the following results were obtained from direct observation:

Average Observed Temperatures.

Of external air	61.2 deg.
Of fire room	76.5 deg.
Of feed water entering boiler	69.3 deg.
Of steam escaping from boiler	321.2 deg.
Of escaping gases from boiler	542.5 deg.
Of furnace gases at front connection	593.8 deg.
Of furnace gases at rear end of combustion chamber	1164.1 deg.
Of furnace	2185. deg.

In considering this set of temperature readings, it is interesting to note that the heat radiation from these boiler settings was sufficient to raise the temperature of the large boiler room 15.3 deg., though there is very little further information obtainable from this observation.

A Waste Discovered Through Gas Temperatures

By taking the temperature of the steam (which is practically the same temperature as that of the boiler) and comparing it to the temperature of the escaping gases, we note that there is a difference of 221.3 deg., which is between 50 and 100 deg. higher than it should be. But this flue-gas reading (of 542.5 deg.) is the temperature reading of the pyrometer direct (with calibration corrections applied) and later in the test report will be found the statement that this temperature has been lowered by the infiltration of a considerable amount of air. Had this air infiltration, through the setting, not taken place, the temperature of the escaping gases would have been 607 deg., which shows that the boiler rejects its gases 285.8 deg. above the temperature of its contained steam, which is certainly wasteful practice.

This consideration caused me to look for a cause, which was found in the fact that this boiler used in its

*Continuation of serial on refinements in testing boilers, and furnaces to be concluded with a contribution on smoke investigation.

construction 4½-in. tubes. Based upon past experience, I entered a note later in my test report stating that had this boiler been constructed with smaller tubes, though they presented no more heating surface, a better heat absorption would have resulted. I then pointed out that by equipping the boiler under test with "heat retarders" the temperature of the escaping gases could be lowered 50 to 100 deg. (with the setting made practically tight).

Approximating Boiler Efficiency

If the specific heat of the furnace gases remained the same at all temperatures; if the boiler setting was perfectly tight, and if our temperature readings could represent the true average temperature at the positions where they were taken, we might use these temperature readings to determine the individual efficiency of the boiler taken apart from the furnace by use of the formula: $E = 100 \frac{T = t}{T}$

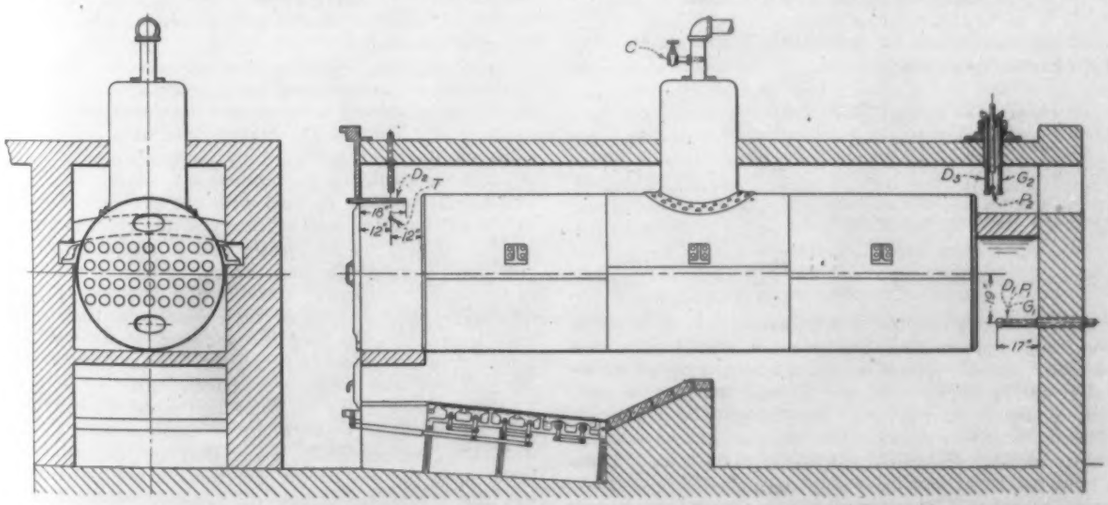
in which E is the percentage of efficiency,
T the temperature of the furnace
and t the temperature of the discharged gases.

The temperatures to be used in these calculations are the number of degrees above the atmospheric temperature which in this case is 77 deg. When the proper care is taken to obtain the closest possible results and corrections, we can use these temperature readings as follows, with an approximation of the correct results, which approximations are often very useful in many considerations. Taking our observed temperature results as given above (less the temperature of the boiler room) and by using this formula we have

$E = 100\ (2108 - 466) \div 2108 = 77.89$ per cent.

By this calculation we are crediting the boiler with a greater reduction in the temperature of its hot gases than it actually accomplishes, due to the air infiltration or the imperfect masonry. By taking proper corrections, to avoid this error, which are obtained through the aid of the gas analysis, we will have the following temperature readings:

Temperature of furnace, deg.....	2185
Temperature at rear connection, deg....	1164
Temperature at front connection, deg...	637
Temperature at flue outlet, deg.....	607



G_1 and G_2 Represent Points Where Gas Samples are Obtained; D_1, D and D_3 are Points for Securing Draft Readings; P_1 and P_2 are Thermo-Electric Pyrometers; T is a Nitrogen Filled Thermometer; C is Point for Taking the Quality of the Steam

FIG. 12—SECTIONS SHOWING BOILER AND FURNACE AS GIVEN IN A TEST REPORT

By using this formula again with these corrected temperatures we will have

$E = 100\ (2108 - 530) \div 2108 = 74.86$ per cent.

Thus we see that the chilling effect of the cold air filtering through the setting has given the boiler an apparent 3 per cent. greater efficiency than it really has. By referring to the calculations given later, it will be seen that the true individual efficiency of this boiler is 76.08 per cent.

Check Calculation for Furnace Temperature

Before leaving this subject I wish to offer a new formula, deduced from the one given. The temperature of the furnace may be approximated when you have the true flue temperature and boiler efficiency, thus:

Furnace temperature = (flue temperature × 100) ÷ (100 — boiler efficiency),

or, taking the test we are considering, we have

$(530 \times 100) \div (100 - 76.08) = 2216$ deg.

As all of the above temperatures are expressed in degrees above the temperature of the atmosphere (i.e., 77 deg.) we must add this to our last result, which gives us

$2216 + 77 = 2293$ deg. F.

which, although 108 deg. too high, is less than 5 per cent. in error, and probably as close to the true result as the furnace temperature readings taken by many will run.

In order to increase the efficiency of this boiler aside from its mechanical defects, a higher furnace temperature is required. By a thermo-chemical calculation it will be found that the highest obtainable temperature using this fuel under perfect (theoretical) conditions of combustion is 3276 deg. By comparing by absolute temperatures we see that we are developing only about 72 per cent. of the available temperature, whereas in good furnace practice we should obtain at least 10 per cent. higher temperature results.

Assuming that we have a furnace temperature of 2600 deg. F. and using retarders in the 4½-in. tubes, our flue gas temperature should not be over 520 deg. Thus we would have

$E = 100\ (2600 - 520) \div 2600 = 80$ per cent.,

which individual boiler efficiency is as low as should be obtained in general practice.

I have been pursuing this course of reasoning to indicate in a very general way how useful correct temperature results are in helping one reason out deductions from observations collected in a test. Without such reasoning the test has a very limited value and perhaps I have made clear how deceiving incorrect reported results really are. The great value of correct temperature for computing the results of the test, including the heat balance, is too self-evident to need further comment.

Full Information Necessary of Fuel Used

There are, unfortunately, too many test reports offered, which purport to show conclusively the superior advantage of some special furnace or furnace attachment which offer little or no definite information concerning the kind of fuel used. I have one before me which is supposed to show how desirable the advertised furnace is by showing how much better it can boil water than the ordinary hand-fired variety.

A furnace designed to use anthracite coal most advantageously is not adapted to handle properly a highly volatile bituminous coal and therefore it is most desirable to show the quality of coal used to obtain the high results usually published and to allow one who studies such tests to decide on the adaptability of this device to his available fuel conditions. Such test reports should include at least a proximate analysis of the coal (if this is the fuel

used) and a determination of its calorific value; and an additional ultimate analysis of the coal will add greatly to the value of the report. The practice altogether too prevalent of making inquiry as to where the coal came from and then copying the analysis from tables or getting the information from the coal companies is abominable as it seldom or never gives the value of the fuel actually used. The coal actually used in the test reported should be carefully sampled and afterward analyzed by a thoroughly competent and reliable chemist.

Securing Sample of the Coal

When weighing up the charges of coal delivered to the fireman, I make it a practice to take a good double handful of coal from each charge (before it is weighed) and use care to select a fairly representative sample, both as to size and quality, and this is thrown into a metal ash can having a cover. At the end of the test a well cleaned floor or platform is selected where the coal is dumped and all large pieces broken with a hammer.

Then it is spread out, well mixed and the quality is made the same throughout the flattened pile, as nearly as the eye can judge. Then the coal is quartered and the two opposite sectors are thrown aside when a new mixing, assorting and quartering is done followed by the rejection of the diametrically opposite quarters and so the sampling is continued until there is left just sufficient coal to fill one or two mason or hermetically sealed 2-qt. jars. If the samples are to be sent a long distance I use tin cans and have their covers soldered tight.

There are, unfortunately, too many who have entered the field of fuel investigation with a lack of training, equipment and experience. It is needless to say that if this work is not done with all the refinement and care that a well trained, experienced and competent chemist is able to command, with the best possible equipment, it may as well be left undone. It must be remembered that a very small sample is used in the laboratory to determine the value of the immense quantity of coal that has been used during the test, and I make it a practice to have most of this work done in such a manner as to check the accuracy of the results.

Misleading Moisture Determinations

In the test which we have been following, the coal used gave the analysis herewith tabulated. It will

Proximate Analysis of Coal.

	Of Coal, Per Cent.	Of Combustible, Per Cent.
Fixed carbon	71.86	77.15
Volatile matter	21.28	22.85
Surface moisture, 0.48 per cent. } Hygroscopic moisture, 0.35 per cent. }	0.83	
Ash	6.03	
	100.00	100.00
Sulphur separately determined	2.67	2.87

be noted that a double determination of moisture is given, and I claim that this practice should be always followed. The accidental moisture which is found in the coal is extremely variable, and if such moisture is carefully expelled, leaving only what might be chemically called the water of combination, we then can have a uniformity of analyses which will enable us to trace the coal to some particular locality or mine.

The expressed percentage of the other constituents will appear very different when we include, say, 6 per cent. of moisture in one analysis and 0.6 per cent. of moisture in another analysis of the same coal. Many rely entirely upon the chemist's report to obtain the percentage of moisture in the fuel used in the test and this almost invariably leads to an error. At the time of this test, by weighing 50 lb. of the coal before and the same coal after drying I found that there was a loss in weight of 2 per cent., due to moisture, whereas the chemist found only 0.48 per cent. of surface moisture in the laboratory.

I have a galvanized pan with handles at each end, measuring 48 x 18 x 2½ in. It contains 50 lb. of bituminous coal with a uniform depth of about 2 in. The carefully weighed sample it contains is taken from the coal such as is fired into the furnace. Then it is generally placed over the top of the boiler, with two pieces of board raising it above the roof of the boiler to prevent the lower layers of coal from being heated to the same high temperature as the boiler top itself. By doubling the shrinkage in weight, expressed in pounds, when using such a drying pan, you have the percentage of surface moisture contained in the coal as fired.

All the ash and clinker taken from the ash pit and furnace during the test, after being weighed is broken, assorted and sampled in the same way as the coal.

Obtaining the Heat Value of the Coal

In the report of the test we are following there occurs the accompanying items on the heat value of the fuel.

Calorific Value of Fuel.

Calorific value by Mahler bomb calorimeter per pound of dry coal	14,436 B.t.u.
Calorific value by Mahler bomb calorimeter per pound of combustible	15,371 B.t.u.
Calorific value calculated from analysis per pound of dry coal	14,528 B.t.u.
Calorific value calculated from analysis per pound of combustible	15,468 B.t.u.

There are probably few items more commonly in error in the general run of test reports than these concerning the calorific determinations of fuels. The appearance upon the market of comparatively cheap apparatus for testing fuels has been taken advantage of by those who pose as fuel experts with small qualifications for such work. They can afford to quote very low figures for making such determinations and the results they present are often very questionable.

For my work I use only the best modified form of the Mahler bomb calorimeter and I claim that the type of apparatus used should be definitely expressed in the report, as I have presented it in the items quoted. The care required in preparing, weighing and handling the samples tested in the calorimeter is work for the seasoned expert as well as the observations and the handling of the apparatus itself. It is by no means uncommon to find statements in reports showing higher calorific values for the samples tested in the calorimeter than are shown in the calculated results, based upon the ultimate analysis of the same fuel. A few moments' thought will show that this exhibits an error, as the calorimeter is nothing more or less than a very refined form of small furnace for burning an exact quantity of fuel and for measuring the heat this fuel generates during combustion.

In calculating from the chemical tests the heat value of the fuel we use the most accurate determinations of the exact heat producing value of each combustible constituent of the fuel. The results obtained give us a 100 per cent. value of the heat produced by combustion. As it is a physical impossibility to produce any form of furnace which will consume its fuel with 100 per cent. efficiency, we cannot look for such efficiency in the fuel calorimeter.

Nevertheless we frequently find it reported as giving over 100 per cent. efficiency, which, of course, shows that an error has occurred either in the analysis or in the calorimeter, and as both of these results are thus thrown into uncertainty by reports showing lower calculated values than the calorimeter results, we can hardly accept these figures with any degree of certainty.

The calorific value of coals is frequently reported in such an indefinite manner that it is impossible to know what their values really are. Whether the results are based upon the dry or the wet basis is not stated and if wet the actual percentage of moisture included in the reported results is not made known. Sufficient moisture is often taken up by the finely pulverized dried sample before it is tested, to change the results. In some reports the statement of calorific value is so indefinite that it is even difficult to understand whether or not they are given for 1 lb. of coal or 1 lb. of combustible.

The test report considered shows the accompanying items on fuel consumption. The last three items are of

Fuel per Hour.

Dry coal consumed per hour	346.04 lb.
Combustible consumed per hour	319.90 lb.
Dry coal per square foot of grate surface per hour	11.54 lb.
Combustible per square foot of grate surface per hour	10.66 lb.
Fixed carbon per square foot of grate surface per hour	8.18 lb.

particular interest and the last one given I have never seen reported in other tests than my own.

Combustion in Terms of Grate Area

The reported items of coal and combustion per square foot of grate per hour are of very limited value as they deal with values which have little to do with the actual grate surface, and unless we look back in our reports to see just what coal is used in the test we are examining we can consider them as items only of secondary interest. As I have stated before, when a fuel, carrying combustible gaseous matter is charged upon a hot fire bed, the first thing which happens is the distilling of this gaseous matter, which rises above the grate surface and is consumed in the attached combustion chamber. It is only the coke that remains behind, which is really consumed directly upon the grate surface.

By examining test reports made in different parts of this country we will find results which might be represented approximately by the accompanying table. Not-

Normal Rates of Combustion with Different Coals.

		Lb. per sq. ft. of grate surface per hour.
Anthracite, Semi-anthracite	Steam sizes	15 lb. to 16 lb.
Semi-bituminous		18 lb.
Eastern bituminous		20 lb.
Western bituminous		30 lb.

withstanding the variable rate of combustion with these coals it will be found that the amount of fixed carbon burned per square foot of grate surface is approximately the same.

In designing furnaces I have found it good practice to design my grate surface on the basis of fixed carbon burned per square foot of grate per hour, irrespective (generally speaking) of the kind of coal to be used. There are, of course, other items to be considered at the same time, including percentage and quality of the ash, etc. The combustion of 8.18 lb. of fixed carbon per square foot of grate per hour, as shown in this test, is too low to obtain the best results, as I have found it better practice to burn 12 lb. or more.

Ascertaining Efficiency of the Boiler

Later in the test report we have been considering I have (in order to conform to the code of the committee of the American Society of Mechanical Engineers) made an entry which, it will be seen, is offered with qualifications. The parts included within the parentheses have

Efficiency (according to the A.S.M.E. Code. See more correct expressions of efficiency stated later in this report.).	
Efficiency of boiler (i.e., heat absorbed by the boiler per pound of combustible divided by the heat value of 1 lb. of combustible)	69.99
Efficiency of boiler including grate (i.e., heat absorbed by the boiler per pound of dry coal, divided by the heat value of 1 lb. of dry coal)	68.90

been inserted by me, to define the operation performed to obtain the given results. Both of these efficiency expressions are more or less obscure and many have asked me which really expresses the true efficiency.

The first expression (efficiency of boiler) certainly does not result in the statement of the boiler's efficiency, but it gives the combined efficiency of the furnace and boiler, neglecting the carbon in the ash.

The second expression (efficiency of boiler including grate) gives the combined efficiency of the furnace and boiler deducting the carbon in the ash.

The first expression, as commonly calculated, fails to take into account that valuable combustible matter has passed through the grates unconsumed with the pure ash. In the test which we are considering this loss is comparatively small, being only 3.88 per cent., but in another test I conducted with a wasteful stoker working under forced conditions I found as unconsumed combustible in the ash pit almost 15 per cent. of the weight of the coal fired. The true individual boiler efficiency in this test was 76.08 per cent. and therefore it could not be properly reported as 69.99 per cent. as apparently reported above.

An observation regarding smoke was reported in the test under consideration. As here given, though a very common way, it is so incomplete and lacking in information that I was led to use more complete methods for smoke observation, which will be discussed in the latter part of this paper.

Smoke Observations.

Immediately after firings, from 60 to 80 per cent. of smoke (according to the Ringelman chart) was visible and an average of about 50 per cent. was maintained during the time of the test.

Original Method of Reporting Furnace Efficiency

It will be noted that the accompanying heat balance shows the distribution of the heating value of the coal as fired and it is not based upon the combustible alone, as is called for in the A.S.M.E. code. Although the relative values of such items as would be stated in the other and more limited method of reporting would be practically the same, I must say that I much prefer to have spread before me all of these items in the manner I have reported them. It gives me a more comprehensive summary of what has actually occurred during the entire test. In stoking a furnace it is not combustible alone that we deliver to our fire bed, but it is impure coal carrying moisture, ash and other impurities, and the more closely we trace the effect of every constituent of the coal which enters the furnace the more satisfactory our analysis becomes.

Heat Balance, or Distribution of the Total Heat Contained in the Coal.

Total Heat Value of 1 Lb. of Coal (as Fired with Moisture), 14,396 B.t.u.

	B.t.u.	Per cent.
(*a*) Heat absorbed by the boiler, as found in the dry saturated steam, per pound of coal as fired	9,928	68.97
(*b*) Loss—due to the non-absorption of heat in the steam evaporated from the— Moisture in the coal; Moisture in the air; Moisture in water of combination	187	1.30
(*c*) Loss—due to the non-absorption of heat contained in the steam formed by the burning of the available hydrogen	511	3.55
(*d*) Loss—due to the heat carried away in the gases delivered to the chimney— Heat in the CO_2, CO, O, SO_2, and N	1,799	12.50
(*e*) Loss—due to excess air filtering through the boiler setting	248	1.72
(*f*) Loss—due to incomplete combustion of carbon.	369	2.56
(*g*) Loss—due to unburned carbon leaving the furnace with the ash	579	4.02
(*h*) Loss—due to heat withdrawn with the ash	27	0.18
(*i*) Loss—due to radiation, etc.	748	5.20
Total	14,396	100.00

The efficiency of the furnace *per se* is next reported in this test, and as this method of reporting is original I will present it here somewhat in detail, believing that it may prove interesting to some who may be unfamiliar with the process employed to obtain the results. I might add that when discussing the preliminary report of the committee appointed by the American Society of Mechanical Engineers to formulate the present code for boiler testing at the fall meeting of that society in 1898, I urged the necessity of stating the efficiencies of the furnace and boiler apart. I had been working for such results for over a year, and since then I have been constantly perfecting my equipment for testing, to enable me to obtain more satisfactory observations concerning the individual efficiencies of each of these separate pieces of apparatus.

At the 1904 annual meeting of the A.S.M.E., Mr. Bement presented a paper calling for more exact methods for determining the efficiency of steam generating apparatus and in discussing his paper I showed how the efficiencies of the boiler and furnace could be separated. Since that time I have been pleased to note the general acceptance of the value of this procedure and we now commonly hear the expression of "combined efficiency" whereas before the simple term "boiler efficiency" was used. As all of our calculations made in determining the furnace efficiency are based upon the theoretical value of the fuel constituents, I use the calorific value of the fuel as determined by calculation from the ultimate chemical analysis as follows:

For the following calculations the heat value of the coal (as fired) is taken from the calculation made according to the modified Dulong formula, from the complete analysis of the coal, and is thus found to be (when recalculated to the wet basis) 14,396 B.t.u.

The observed results obtained during test; the ultimate analysis of the coal and the furnace gas analyses considered together, show us that in 100 lb. of fuel used the fuel and other constituents are disposed of as here tabulated:

The Individual Efficiency of the Furnace (Considered Apart from the Boiler).

3.88 lb. of carbon to ash pit.
70.309 lb. of carbon burned to CO_2.
3.561 lb. of carbon burned to CO.
4.409 lb. of hydrogen burned to H_2O.
2.61 lb. of sulphur burned to SO_2.
0.631 lb. of hydrogen } Combined in coal forming water.
5.050 lb. of oxygen }
1.260 lb. of nitrogen (unburned).
2.350 lb. of water (the moisture in the coal).
5.940 lb. of ash (unburned).

100.000

Excess of air used in furnace, per cent..... 49
Excess of air found in flue, per cent..... 71
Dry gas per lb. of coal..... 15.237 lb.
Dry gas per lb. of carbon..... 20.63 lb.
Dry air per lb. of coal..... 14.812 lb.
Dry air per lb. of carbon..... 20.05 lb.

From the above results we can calculate the individual furnace efficiency, thus:

		Per lb. of fuel.		B.t.u.		B.t.u.
C to CO_2	=	0.70309	×	14,600	=	10,265.114
C to CO	=	0.03561	×	4.450	=	158.465
H to H_2O	=	0.04409	×	62,000	=	2,733.580
S to SO_2	=	0.0261	×	4,000	=	104.400
Total heat generated.....						13,261.559

B.t.u. generated (13,262) divided by the B.t.u. in the coal (14,396) or:
13,262 ÷ 14,396 = 92.123 per cent., the furnace efficiency.
From this result, we see that our furnace loss is:
100 — 92.123 = 7.877 per cent.;
or, 14,369 × 0.07877 = 1,132 B.t.u.

With the information now before us we can show a furnace balance, considering (for convenience) the combustion of 100 lb. of coal.

DR.		CR.	
Entering furnace.	Lb.	Discharged to chimney.	Lb.
To coal	100.000	By oxygen	112.959
" air	1481.241	" nitrogen	1139.621
" moisture in air.....	6.461	" carbon dioxide	257.800
		" carbon monoxide ...	8.309
		" water (as superheated steam)....	54.173
		" sulphur dioxide	5.220
		Discharged to ash pit.	
		By pure ash.....	5.940
		" carbon (with ash)..	3.880
	1587.702		1587.702

From the process just given we see that the individual efficiency of the furnace is the ratio of the total heat delivered from the furnace to the total heat value of the coal delivered to the furnace.

We next wish to determine the individual boiler efficiency which may be defined as the ratio of the total heat absorbed by the boiler to the total heat delivered by the furnace to the boiler.

As we have just seen, the total heat delivered by the furnace is 13,262 B.t.u., but the heat balance shows us that we have a loss of 248 B.t.u., due to leakage of cold air through the setting. As all the masonry surrounding the boiler is really a part of the furnace, we must deduct this amount in order to express the true amount of heat made available for service to the boiler, thus we have 13,262 — 248 = 13,014 B.t.u. available for boiler use. This figure can be taken directly in our boiler efficiency calculation, but I propose to give the complete method of reaching all of this required information by making use of the heat balance, which is as follows:

The Individual Efficiency of the Boiler Determined from Data Contained in the Heat Balance.

By using the well-known thermodynamic formula—$E = 100 (H - h) \div H$—the individual efficiency of the boiler may be calculated as follows: In this formula—
E = the individual efficiency of the boiler referred to the total heat delivered from the furnace;
H = the number of British thermal units delivered by the furnace to the boiler, i.e., 14,396 minus items $(f) + (g) + (h) + 380$ B.t.u. from $(i) = 187 + 511 + 1799 + 248 + 368 = 3113$. 13,014;
h = the number of British thermal units rejected from the boiler to the chimney, i.e., items $(b) + (c) + (d) + (e) + 368$ B.t.u. from $(i) = 187 + 511 + 1799 + 248 + 368 = 4113$.
Thus we have
100 (13,014 — 3113) ÷ 13,014 = 76.08 per cent., the boiler efficiency.

Having now determined the individual boiler efficiency (76.08 per cent.) and the individual furnace efficiency (92.123 per cent.) by multiplying these two percentages together we obtain the

Combined Furnace and Boiler Efficiency

Thus: 92.123 per cent. of 76.08 per cent. = 70.09 per cent. This result will be found to be but a little over 1 per cent. in excess of the efficiency expressed in item (*a*) of the heat balance.

The Thomas Meter as a Large Consumer's Meter

The Thomas meter for indicating, integrating and graphically recording the quantity of flow of gases was described in *The Iron Age*, March 16, 1911, and mention was made on August 31, 1911, of two notable installations where these meters were used for measuring the flow of gas for public utility corporations. In an eight-page pamphlet recently issued by the Cutler-Hammer Mfg. Company, Milwaukee, Wis., an installation of one of these meters which is used as a consumer's meter on his premises is described. This particular meter measures the artificial gas used as fuel at a pumping station which has recently been installed in connection with the sewage and drainage system in the city of East St. Louis, Ill. This installation is a striking example of the application of this meter to the measurement of fuel gases for internal combustion engines and especially when these gases are under pressure. Other features worthy of note are flexibility of installation, the adaptability of the meter to intermittent service and the fact that it is operating in a location where there is no continuous and reliable source of heat to prevent freezing.

The function of this station is to pump the drainage and liquid sewage from the city against the head of the Mississippi River when the latter is above the level at which the water will drain into it by gravity. The centrifugal pumps in this station are driven by internal combustion engines and are operated intermittently, the period of operation and the number in service at any one time being dependent upon the rainfall and the hight of the river. The gas is pumped out to the station through a special 6-in. line, and enters the station under pressure, which is reduced to a constant suction pressure for all the engines by an automatic pressure governor located inside the station.

The main stop valve is located inside the station and is electrically connected with the Thomas meter installed in the supply line between the main stop valve and the reducing governor to measure the gas under pressure, so that the latter is thrown into service as soon as the valve starts to open. The recording panel is located in another part of the station and the leads from the meter are run in conduit. The supply of electrical energy for the meter is taken from a 110-volt alternating-current, single-phase, 60-cycle line running into the station. The control mechanism is inclosed in a locked case and the recording instruments have locks or seals. The maximum capacity of the meter is 40,000 cu. ft. per hour. An integrating meter in the upper left corner of the recording panel shows the totalized value of gas flow in cubic feet at a pressure of 30 in. of mercury and 60 deg. F., and the graphic meter in the opposite corner shows at a glance whether the gas is being used at all and if so the rate at the same standards.

The Crucible Coal Company, an identified interest of the Pittsburgh Crucible Steel Company, is arranging to operate its new coking coal mines in Greene County, Pa., which will supply coal for the coke ovens of that company, located near the steel plant at Midland, Pa. An interesting feature of this operation is that, while the coal is being mined exclusively for coking purposes, there will be no ovens near the mines; all the coal will be loaded into especially built steel barges and thus taken down the Monongahela and Ohio rivers to the ovens near the mills. A somewhat similar plan is being followed by the Jones & Laughlin Steel Company in supplying coking coal for its ovens in Pittsburgh, from the Vesta mines on the Monongahela River.

Chrome-vanadium steel, because of its property of giving a high elastic limit combined with hardness and great toughness when subjected to heat treatment, is being used with good results for locomotive tires, as is pointed out in an article in American Vanadium Facts for October. With the marked increase in weight and power of locomotives in recent years, the tire mileage has rapidly decreased and the trouble from shelling or flaking on the tread has increased. The vanadium steel tire is said to have an elastic limit 100 per cent. greater than a carbon steel tire and there is greater ductility.

The Steel Corporation Dissolution Suit

More Hearings at Pittsburgh—Henry Wick, Henry Chalfant, Samuel A. Benner, Joseph G. Butler, Jr., Railroad Men and Trade Paper Representatives Examined

The taking of testimony in the suit of the Government to dissolve the United States Steel Corporation was resumed in Pittsburgh October 29, with Henry P. Brown, special master, in the chair. The first witness called was Henry Wick, Youngstown, Ohio, formerly president Ohio Steel Company and later vice-president and chairman of the executive committee of the National Steel Company. The Ohio Steel Company had a Bessemer plant, making sheet and tin bars and steel rails, and was taken over by the National Steel Company in 1899. In 1901, when merged into the United States Steel Corporation, the plant also had four blast furnaces. He named the chief competitors of the National Steel Company and was then asked by Judge Dickinson, counsel for the Government, as to how changes were brought about in the market price.

Henry Wick Explains Market Prices

In reply to Judge Dickinson's question, Mr. Wick said that the market price depended on the law of supply and demand. Judge Dickinson then asked for an explanation of the workings of this law, apparently desiring Mr. Wick to tell why, when the market price changed, all the manufacturers made the change simultaneously, obviously intimating that these simultaneous changes were due to some agreement on the part of the manufacturers. Mr. Wick replied:

"Each manufacturer took business at the best price he could obtain. At times when the production forged ahead of the demand, consumers were not willing to pay as much as the manufacturers asked. It would then happen that some manufacturer, who was eager to get the business, would make a sale at less than the market price. This sale would get out through the trade papers and in other ways, with the result that the other manufacturers, if they wanted a share of the business, would have to meet the reduction. At times when demand was ahead of production, the manufacturers would ask a premium, thus bringing about an advance in the market price."

In cross-examination, Mr. Wick recalled one instance, about 30 years ago, when J. L. Kennedy, of the J. Painter & Sons Company, went out and in one day booked large orders by going considerably under the market price. Mr. Wick considered that this was a shrewd move as the J. Painter & Sons Company was thus able to keep its mills going while waiting to book orders at its own prices.

Henry Chalfant on the Wrought Pipe Association

Henry Chalfant, president of Spang, Chalfant & Co., Inc., gave testimony relating to meetings of the manufacturers of lap-welded tubes which were held at intervals from 1896 to 1906. George Timmons, Syracuse, N. Y., was secretary. The organization was known as the "association," and its purpose was to allot the tube business to the various companies forming the association. He testified that 50 per cent. of this business went to the National Tube Company. The meetings were held monthly; they discussed trade conditions and had golf parties and dinners. During these meetings the secretary would read the report of the business done since the last meeting, and if any member was found to have exceeded his allotment of business he would be assessed the penalty provided in the agreement among the various companies. The witness characterized the penalty assessed by the association as "a small payment."

On cross-examination an attempt was made to have Mr. Chalfant testify that the "small payment" was only large enough to defray the expenses of the golf matches and dinners, but he replied: "It was more than that." He said that there were no written agreements.

Samuel A. Benner on Market Conditions

Samuel A. Benner, until recently assistant to the president of the Pittsburgh Steel Company, but previously and for many years in the sales department of the Carnegie Steel Company, told about the meetings of the old billet, bar and plate associations at which he and Col. H. P. Bope represented the Carnegie Steel Company. The meetings usually opened with a discussion as to general market conditions, the amount of business taken, how prices were being upheld, etc. The members would then announce the prices which they intended to charge. At times, when one of the manufacturers was known to have cut the price which had been announced, a meeting was called and general recrimination took place. Price revulsions were often caused when one company took a customer away from another, usually by cutting under the market price. The aggrieved company would retaliate by further cutting prices and taking customers away from its rival.

Mr. Benner stated that, owing to co-operation between the United States Steel Corporation and the other steel makers, prices were fairly well sustained during 1907 and 1908, following the panic of October, 1907, but that in the latter part of 1908 and early in 1909 there was a good deal of cutting by the smaller concerns, with the result that in February, 1909, an "open market" was declared, and prices on all kinds of finished steel products dropped rapidly from $3 to $5 a ton. He said that when the panic started in 1907 jobbers all over the country had very heavy stocks of goods, but that owing to the control of the market at that time they were able to work off most of such stocks at fair prices and without any great loss.

Mr. Benner was questioned, later on in the examination, as to what he meant by "formal agreements." He had previously said that no formal agreements were entered into by the plate, bar and billet associations. By formal agreements, he said, he meant promises, either oral or written.

"Then your agreements were more a matter of faith and hope than of promise and contract?" interjected Mr. Lindabury, counsel for the Steel Corporation.

"Yes, I should say so."

"Were they mostly faith?" asked Judge Dickinson.

"Mostly hope," said Mr. Benner.

B. S. Stevenson, formerly New York correspondent of the Iron Trade Review, but now representing M. A. Hanna & Co., Cleveland, Ohio, in the Pittsburgh district, was asked to identify certain articles which appeared in that publication during the years 1907 and 1908.

Joseph G. Butler, Jr., and the Bessemer Pig Iron Association

Joseph G. Butler, Jr., the well-known pig iron manufacturer, Youngstown, Ohio, stated that he had been engaged in the manufacture of pig iron in the Mahoning Valley since 1866. He was secretary of the Bessemer Pig Iron Association, formed 17 years ago, and dissolved about two years ago. He named the members of the association and stated that the output of their furnaces was between 1,000,000 and 1,200,000 tons of pig iron per year. His duties consisted in negotiating sales of pig iron, gathering statistical reports from information furnished by the members and keeping records of operations of the furnaces, stocks of ore and other work. He was asked whether the United States Steel Corporation bought iron from the Bessemer Pig Iron Association and he answered that it did through the Carnegie Steel Company and was one of the association's best customers. Mr. Butler referred to several large sales of pig iron made by the association to the Carnegie Steel Company and at prices which he believed were fair to both the buyer and the seller. He said that one of these transactions involved 400,000 tons of Bessemer iron for delivery over an extended period. He also stated that the Republic Iron & Steel Company, Cambria Steel Company and Youngstown Sheet & Tube Company were large buyers of pig iron during the life of the association.

D. T. McCabe, fourth vice-president of the Pennsylvania Lines West, gave testimony relating mostly to the Central Freight Association, entering into details of meetings of this organization with large furnace and ore interests in the Central West.

Robert A. Walker Quizzed About Articles in "The Iron Age"

Robert A. Walker, resident editor of *The Iron Age* at Pittsburgh, was asked regarding articles appearing in *The Iron Age* from 1896 to 1906, most of them relating to the organization of the Union Steel Company and the Sharon Steel Company, and their absorption later by the United States Steel Corporation. He also testified in regard to printed reports in *The Iron Age* in 1900 to the effect that the Carnegie Steel Company would build pipe and tube mills at Conneaut, Ohio.

Mr. Colton, for the Government, read a number of old contracts for steel billets between the Pittsburgh Steel Company and various steel manufacturers from 1903 to 1905, for the purpose of getting them into the record. One dated July 1, 1903, with the Carnegie Steel Company, to run to July 1, 1904, was for basic open-hearth and Bessemer billets, at a price $2 below the price set by the Steel Billet Association, price in no case to exceed $25 per gross ton, delivered f.o.b. buyer's works at Monessen or Glassport, Pa. The estimated requirements, as set forth in this contract, were 15,000 gross tons per month.

The hearings were adjourned October 30, and it is understood will be resumed in Washington, D. C., about November 15. It had been expected that hearings would take place at Cleveland, Ohio, but this is stated to have been rendered unnecessary through the offer by the Steel Corporation to furnish all the information intended to be gathered there.

Manual Training School Electric Drives

The isolated generating plants and the motor installations in the Central and Union high schools of Grand Rapids, Mich., are exceptional examples of electric drive for manual training purposes. Another interesting feature about these installations is that each school has its own generating plant for carrying the manual training load.

The power for the manual training department of the Central High School is generated in a plant located in the basement at the rear of the building. The engine room contains a Westinghouse type Q direct-current, three-wire generator directly connected to an automatic cut-off engine built by the Ball Engine Company, Erie, Pa. The generator has a capacity of 75 kw. and generates 300 amperes at a speed of 275 r.p.m. In connection with the 125-250-volt three-wire system, two 1.33-kva., 13½-cycle, 177-88-volt balance coils are used to take care of any unbalancing which might take place in the system. For controlling the power generated a four-panel switchboard mounted on an angle-iron frame is provided. The panel on the extreme left is the generator panel and is equipped with the necessary measuring instruments, rheostats and switches. This panel is arranged to take care of the output of two generators, although at the present time but one is installed. The two central panels are fed from the municipal plant which supplies power to light the building, a load of about 70 kw. being installed. The remaining panel is connected to the supply mains of the Grand Rapids-Muskegon Power Company, the energy from these mains being ordinarily employed to drive a sump motor in the boiler room and also an attic motor in connection with the ventilating system. An emergency connection is provided so that power for lighting can be supplied by this company.

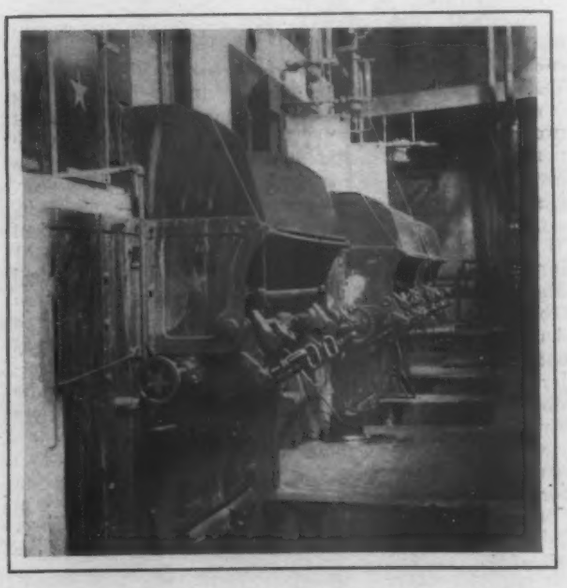


Fig. 1—The Boiler Room of the Central High School, Grand Rapids, Mich., Showing Roney Stoker Installation

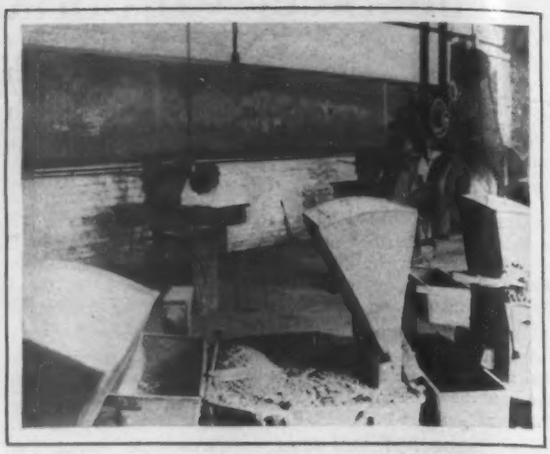


Fig. 2—View in the Forge Shop of the Union High School, Grand Rapids, Mich.

The boiler room is extensively equipped. Included in the equipment are three Wicks-horizontal water tube 227-hp. boilers with Roney stokers, shown in Fig. 1, a Cochrane feed water heater, a feed pump and a pressure raising pump. The conditions imposed upon the stokers are very exacting, since the school is located in one of the best residential sections of the city, and smoke from the plant is not permissible. In addition the coal used is poor slack, which makes it all the more important that the stokers prevent smoking. A large stack is provided for draft and also for carrying off any smoke that might come out.

In the wood-turning room of this school the lathes are driven by one motor from a line shaft and all the other machines have their individual motors arranged for belt drive. The other manual training rooms in this school include the bench and preparation rooms. The motor load installed at this school is divided among these three rooms as follows: Bench room, 4 machines, 11 hp.; wood-turning room, 6 machines, 19 hp., and preparation room, 1 machine, 3 hp. This gives a total load of 33 hp. for the 11 motor-driven machines and in addition motors aggregating 20 hp. are employed for group drive. The capacity of these shops is 160 pupils per day.

The installation in the Union High School is similar to that at the Central High School. The shops at the former school are, however, more extensive as they consist of bench, wood turning, preparation, machine and forge shops, the last being shown in Fig. 2. There are a large number of motors installed in this school, the total capacity being 101½ hp. This is divided between the various rooms as follows: Bench room, 6 motor-driven machines, 17 hp.; wood-turning room, 7 machines, 23 hp.; preparation room, 3 machines, 11 hp.; machine shop, 5 machines, 12½ hp., and forge shop, 4 machines, 20½ hp. In this installation there are 26 motor-driven machines with a total capacity of 84 hp. and 17½ hp. in motor for the group driven machinery. These shops can accommodate 320 pupils per day. The power for driving the motors used in the various rooms is supplied by a Westinghouse type Q, 75-kw., 125-250-volt, three-wire generator, direct-connected to an 18 x 14-in. Ball engine. The switchboard, stoker and boiler equipment is similar in both schools.

New Tools and Appliances

This is essentially a news department for which information is invited.

Rotary Air Compressor.—The Wernicke-Hatcher Pump Company, Grand Rapids, Mich., has brought out a rotary pump capable of pumping air or liquid against any desired pressure up to 200 lb. per square inch and also an almost absolute vacuum. The mechanism consists of a rotating cylinder inside a rotating case, the space between the two being divided into pockets which act as suction and compression spaces. The size of these pockets varies at each revolution. The fluid is taken in at one end of the shaft and discharged at the other.

Horizontal Boring Drilling and Milling Machine.—The Lucas Machine Tool Company, Cleveland, Ohio, has brought out a new model of its Precision horizontal boring, drilling and milling machine which has a 3-in. spindle. In general the features and improvements of the company's No. 32 machine with a 3½-in. spindle and the No. 33 machine with a 4½-in. spindle, which was illustrated in *The Iron Age*, April 4, 1912, have been incorporated in the construction of the new size which is known as the No. 31. This machine has a constant speed power rapid traverse to all parts having feeds, and this is so arranged that no matter what feed is used or in which direction, the quick return is obtained by simply moving the feed and quick return lever in the opposite direction. The feeds are controlled by the position of the interlocking feed selecting levers, and it is pointed out that it is impossible to use the power rapid traverse when any feed is engaged, or vice versa. In common with the two larger machines, the new size can be furnished with a vertical milling attachment which greatly increases its usefulness and versatility.

Brush Bar Belt Dressing.—The Wayo Mfg. Company, Buffalo, N. Y., has brought out a type of belt dressing which is put up in cylindrical form, and at one end of the bar there is a leather brush. In use the belt is first cleaned by applying the leather brush while the belt is running, and thus removing the dirt which gathers and forms lumps on the surface. The bar is then reversed and the dressing applied to the entire surface of the belt in an even layer. In addition the brush also serves as a handle so that the entire stick of dressing can be used.

Boring Tool.—For use in fine milling machine and similar work, the Precision Tool Company, Lansing, Mich., has developed a new form of precision boring head. The tool is held in the outer end by a compression nut and there is a segment attached to the inner end of the adjusting ball. This segment is controlled by an adjusting screw having a micrometer head which permits accurate adjustment to secure any desired radius of the tool point within the range of the tool. As soon as the desired adjustment has been reached, a knurled nut clamps the adjusting ball tightly in place against a spherical seat. This arrangement gives a rigid construction and also incloses all the working parts against the entrance of chips or other foreign material.

A New Hydraulic Transmission.—The Universal Speed Control Company, 19 Liberty street, New York City, has brought out a new type of hydraulic transmission, which, while designed primarily for automobiles and motor trucks, can also be applied in the machinery field as a substitute for belts and gears. The device consists of pump cylinders mounted on the motor shaft and a reaction plate which is also mounted thereon. The axis of this plate coincides with that of the shaft at one point so that it can be swung to different angles on the shaft and be driven by it. When the plate is swung at right angles to the motor shaft, no movement of the pistons can take place, but any movement of the plate away from this position brings it at an angle with the motor shaft and varies the stroke of the piston a corresponding amount. Any movement of the piston forces oil into the hydraulic motor end of the apparatus and imparts motion which is in proportion to the amount of oil pumped.

Drilling and Tapping Machine.—The Frontier Iron Works, Buffalo, N. Y., has recently designed and built a 16-in. drilling and tapping machine in which the driving pulley shaft runs into the gear case and drives the spindle bevel pinions directly through a bevel gear. These gears are constantly in mesh and are thrown into operation by engaging clutches to give a two-speed drive to the spindle and a reverse motion for tapping. A lever placed level with the spindle sleeve bearing throws the gears into operation and the change from the drilling position to the tapping one is made by releasing a cam at the upper end of the lever. The clutches normally remain in a neutral position and the simultaneous use of two clutches is prevented.

Vertical Chucking Machine.—A 36-in. vertical chucking machine which is intended for handling carwheels, pulleys and work of this character has been brought out by H. Bickford & Co., Lakeport, N. H. The octagonal spindle is counterbalanced and the feed is operated by a large friction worm gear running in oil on the left side of the head. This gear derives its power from a geared feed shaft connected to the main driving shaft by a four-step cone pulley. Quick return and hand adjustment are supplied by a handwheel and the friction feed is engaged through a small handwheel located at the same point. Bevel gears drive the table and the spindle upon which it turns is fitted with adjustable boxes. A hardened and ground steel step bearing, which is submerged in oil and is adjustable, takes the weight of the table and the work. The floor space occupied by the machine is 7½ x 3 ft., and the weight is 4000 lb.

Metal Sawing Machine.—The Vulcan Engineering Sales Company, 2014 Fisher Building, Chicago, Ill., has recently brought out a small metal sawing machine in which the saw blade is driven from the periphery by steel rollers which are journaled in removable steel bushings that are securely held in the double driving gear. This drive renders a large diameter of the blade available and the steel rolls are readily replaceable. The double gear containing the saw driving rollers is journaled on a stud which is held in a radial T-slot cast in the side of the carriage. Wear on the saw blade is compensated for by loosening the stud and lowering the double gear until the rollers properly mesh in the saw blade. The working surface of the table is sufficiently large to enable beams and channels to be supported while being cut off at any angle up to 45 deg. A variable friction feed ranging from 3/16 to 1 in. per minute is available and can be adjusted while the machine is in operation. The capacity of the machine is rounds and squares up to 6 in. and I-beams in a vertical position up to 10 in. The machine can be supplied with either a belt or direct-connected motor drive.

Set Square.—E. L. Fuller, Trimont Mfg. Company, Roxbury, Mass., has designed a set square in which it is intended to incorporate in one instrument the necessary means to obtain all the angles commonly used in the execution of shop drawings. This device consists of a straight edge with an irregularly shaped figure having the various angles marked. Three different sizes of holes are provided to serve as an aid to the draftsman in holding the instrument firm and also for use in drawing fillets for a design.

Lathe Tool Grinding Machine.—W. W. Blakely, 100 Leicester street, Detroit, Mich., has recently designed a lathe tool grinding machine which is intended to do away with the necessity of leaving the lathe whenever the cutting tools have to be ground. A friction contact with one of the steps of the lathe cone pulley drives the attachment and it is thrown in or out of operation by a small hand lever, being locked in either position so that the wheel runs only when in use. The device is adjustable to any size of cone pulley and carries a wheel measuring 5 x ⅝ in.

Spiral Cutter Grinding Machine.—A semi-automatic spiral cutter grinding machine has been recently designed and built by the Sloan & Chace Mfg. Company, Newark, N. J. A spiral cam governs the travel of the grinding wheel and the spindle on which the cutter to be ground is mounted is driven through gearing from the camshaft. The machine is of rigid construction and the bearing surfaces are of a good working length. The emery wheel spindle is fitted with ball bearings and cutters up to 1½ in. and 2 in. in length can be mounted between the centers of the spindle. The size of emery wheel used is 4 in. in diameter and the machine will grind an eight-tooth, 45-deg. cutter in 3 min.

The Machinery Markets

Despite a little hesitancy shown by buyers here and there because of the presidential election, a condition which has been almost totally absent heretofore in the present campaign, trade generally is active and the prospects show no very great falling off and in some centers are exceptionally good. The past week has been a little slower in New York, although some good business was placed and some excellent railroad business is anticipated. New England factories are running to full capacity and the scarcity of labor continues to be felt. There has been a good aggregate of sales in Philadelphia and price advances on special machinery are reported. In Cincinnati both export and domestic trade were satisfactory in October and railroad buying will be resumed soon from present indications. Inquiries are not quite so numerous in Cleveland, although a good volume of sales were made in the last week and some machinery dealers have not caught up on deliveries. The automobile trade continues a good buyer in Detroit, although there has been a slight falling off in orders and manufacturing is hampered by lack of workmen. The inquiry for machine tools has been exceptionally good in Chicago, where the trade is expecting an additional list from the Illinois Central. An abundance of small orders have been received in the Central South and rising prices there have not halted trade. Birmingham is now having the quietest period of the fall, but general conditions are strong and the comparative inactivity is expected to be short-lived. The election tended to quiet trade in St. Louis, but there is no loss of confidence. Demand is increasing in Texas and prospects are plentiful. On the Pacific coast conditions are good and plans are under way for the shipment of much mining and other equipment to Alaska in the spring.

New York

NEW YORK, November 4, 1912.

On the eve of the presidential election there is reported a good volume of business placed in the last few days, indicating that the usual pre-election subsidence of activity has been considerably minimized, almost to the moment of casting the ballots. At the same time it cannot be denied that in some quarters at least there has been some hesitancy shown in the last week in regard to both orders and inquiries. This was only natural in view of the intensified interest in politics and the fact that machinery men with more concern than previously exhibited in this campaign were asking each other for opinions as to the probable effect on trade of the election. A surprisingly large number of managers and salesmen asserted that they expected no deterrent effects, while a fewer number expressed uncertainty. With most firms, October closed in a way that was satisfactory in point of business done.

The next large proposition to come before the machine tool trade will probably be the requirements of the Boston & Maine Railroad for its new shops at Bellerica, near Lowell, Mass., which will represent an expenditure of about $300,000. At least 200 tools will be embraced in the list, providing facilities for repairing 30 locomotives, 200 passenger cars and 1000 freight cars each month. The new shop is well on toward completion and the list of machinery requirements is now understood to be in the hands of B. S. Hinckley, purchasing agent, at Boston. A boost was given to trade in the last week by the placing of between $25,000 and $30,000 worth of business by the Morrow Mfg. Company, Elmira, N. Y., and more is to follow. This business is taken as an evidence of confidence on the part of automobile manufacturers, as the Morrow Mfg. Company's plant is largely devoted to the output of automobile parts. The automobile companies not only look for a good home trade, but are building heavily for export. The demand for rubber manufacturing machinery is very good, partly traceable to the activity in automobile building. Crane companies have placed a number of locomotive cranes with contractors on New York City subway work in the last few weeks. Requirements of the New York, New Haven & Hartford Railroad for its Van Nest shops, recently referred to, have been filled. The Southern Railway, which has been buying one or two tools from time to time to fill in, is in the market for a large turret lathe.

The Cyclone Drill Company, 30 Church street, New York, of which A. M. Ferguson is Eastern sales manager, has just sold what is said to be the largest gasoline traction well drilling machine ever built. It is of special design, equipped with a 25 hp. double cylinder engine and will handle 6, 8 and 10 in. bits to a depth of 1000 ft. It was built at the company's works at Orrville, Ohio, and will be shipped to Connecticut.

The Department of Water Supply, Gas and Electricity, city of New York, is advertising for bids to be submitted November 15 on a portable gasoline engine driven electric generating outfit, with motor, wiring, etc. The department will allow 75 calendar days for delivery and requires a security of $1,500. Further details can be obtained from Commissioner Henry S. Thompson, 13 Park Row.

The Edison Storage Battery Company, Orange, N. J., has had plans prepared for additional buildings to its storage battery plant. The plants call for two buildings, one six stories with 180,000 sq. ft. of floor space and another two stories with 60,000 sq. ft. of floor space, giving the company a little more than double its present capacity. Work will be commenced some time in the spring. The machinery requirements will be largely of a special character and much of it will be manufactured in the company's own shops.

The Somerville Iron Works, Somerville, N. J., manufacturer of steel pipe and fittings, will erect a large addition to its plant in East Somerville. The new building is to be used as a machine and pattern shop and will be erected on the west side of James street, facing its main plant. Details as to its equipment are not yet available.

The Huntley Mfg. Company, Silver Creek, N. Y., is taking bids through F. A. Shoemaker, 21 Builders' Exchange, Buffalo, on a vacuum heating plant, including two horizontal return tubular boilers, 100 hp., and is also considering a natural gas engine, direct connected to a 200 kw. generator.

Veeder & Brown, Schenectady, N. Y., has taken out a permit for the erection of a woodworking and planing mill, 76 x 91 ft., two stories, on Deck street.

Milliken Brothers, Inc., Mariner's Harbor, S. I., has filed plans for a frame galvanizing plant, 50 x 167 ft., one story, to cost $5000.

Incorporation papers have been filed by the Blasier Sanborn Company, Utica, N. Y., which will engage in the manufacture of pressing devices operated by steam and other means. The capital stock of the company is $350,000, and the directors are G. W. Sanborn, F. A. Klein and C. H. Osborn, Utica.

The Duffney Brick Company, Mechanicsville, N. Y., has plans in preparation for the installation of a power plant at its works.

The Inter-Village Electric Corporation, Hamburg, N. Y., has been incorporated with a capital stock of $25,000 to develop electricity for power. A plant will be constructed. The incorporators are C. M. Baldy, George Harmon, Buffalo, and C. H. Tayler, Williamsville.

The Firth Carpet Company, Auburn, N. Y., is completing an extensive addition to its plant and will install machinery for the manufacture of axminster rugs and carpets.

The Water Department of the city of Binghamton, N. Y., is completing plans for an addition to the filtration plant which will double its capacity. M. Stoppard, superintendent, is receiving bids from filter builders.

The Ernest Bischoff Company, Inc., Spring Valley, N. Y., has been incorporated with a capital stock of $25,000 and will engage in the manufacture of drugs, medicines, chemicals, etc. Preparations for a plant are being made. Ernest Bischoff and A. Bischoff, New York City, and A. P. Wagner, Brooklyn, are the directors.

The People's Gas & Electric Company, Oswego, N. Y., has commenced work on an addition to its plant which will largely increase its capacity. The addition, with equipment, will call for an expenditure of about $30,000.

The Smith Organ Company, North Tonawanda, N. Y., recently incorporated, has plans in preparation for a plant for the manufacture of musical instruments. It is expected construction work will be commenced soon.

The Camden Paper Company, Camden, N. Y., has been incorporated with a capital stock of $25,000. The incorporators are C. B. Peachim and F. D. Lamb, Utica, and W. E. Hedley, Little Falls, N. Y. Will manufacture paper and a plant is being arranged for.

Catalogues Wanted

O. M. Jones, jobber and manufacturers' agent, 30 Church street, New York, desires manufacturers' catalogues and trade literature in steam, water, air, gas and oil equipment.

New England

BOSTON, MASS., November 4, 1912.

Beyond the fact that everyone has been discussing the election for the past week, the influence of the Presidential campaign upon business has been felt but slightly. The only worry is the scarcity of labor. Nearly every manufacturing establishment in New England coud put men to work if they coud be had. The wire industry is a striking example of this. In Worcester alone a thousand men could be placed in a day. The mills are running to their fullest capacity up to the point of available working forces. The opinion of New England banking circles concerning the outlook is contained in a statement just published for private circulation by a conservative small city bank, as follows:

It is worthy of note that mercantile and manufacturing business on the whole is practically what it was at this date in 1905. Activity in the stock and bond market is just a shade below what it was at that time and banking conditions are about the same. By going back to November 1, 1905, we will find the business situation very similar to that which we have to-day, and in the closing months of 1905 and the opening months of 1906 we will find a series of events which, it is reasonable to presume, will be followed fairly closely in the next few months.

The Stanley Bronze Company, Bridgeport, Conn., has established works for the manufacture of castings in all non-ferrous metals, with a specialty of copper castings. The incorporators are Paul L. Miller, Bridgeport; Charles E. Williamson, Darien, Conn.; and E. S. Young, East Norwalk, Conn. The company begins business with $20,000 capital stock.

The J. D. Bergen Company, Meriden, Conn., manufacturer of cut glass, states that it is not yet ready to give details of the new foundry which will be erected in that city.

The Albertson Folding Typewriting Company, New York, is to transfer its manufacturing plant to Fairfield, Conn., occupying space in the Perry Building. Local capital has become interested in the invention. E. H. Albertson, the inventor, will manage the factory.

The Wrapping Machine Company, Springfield, Mass., has been organized as a holding company, in connection with the Berger Mfg. Company, under which name the manufacturing end of the business will be continued. A. Linton Bausman is the president, Ralph P. Alden, treasurer, and Arthur F. Bassett the third director.

The Merchants Cold Storage & Warehouse Trust Company, Lynn, Mass., has been organized and will erect a plant to cost $1,000,000. It will consist of an eight story building, 100 x 200 ft., of brick, steel and concrete, and an engine room, 81 x 100 ft., three stories, which will contain a number of engines, electric generating apparatus and the machinery used in producing artificial refrigeration.

The Mason & Parker Mfg. Company, Winchendon, Mass., a new corporation, has purchased the Mason & Parker factory in that town recently owned by the Hardware & Woodenware Mfg. Company. The incorporators are Elisha M. Whitney, William H. Brown, Arthur L. Brown, Eaton D. Sargent and W. H. Prichard. The capital stock is $20,000. The building was recently partially destroyed by fire, and will be rebuilt. The company will manufacture toys, which has been the specialty of the factory for years.

In regard to the purchase by Landers, Frary & Clark, New Britain, Conn., of the business and plant of the Humason & Beckley Mfg. Company of that city, manufacturer of cutlery, the new owner states that it will run the business for the present as a separate concern, strictly maintaining the quality of the goods, and freshening up the lines.

The Stamford German Silver Company, Stamford, Conn., will establish a plant at Springvale, to consist of a rolling mill, 75 x 150 ft., furnace room, 25 x 75 ft., and casting shop, 36 x 68 ft., all one story, of brick. Electric power will be used. W. B. Beckley is the president, George C. Harrison treasurer, and J. G. Mackay the third director.

The Sheffield Scientific School of Yale University, New Haven, Conn., has awarded the contract for its electrical laboratory, which will be 76 x 116 ft., with an ell 56 x 62 ft., three stories, of brick and stone, fireproof construction.

The American Volsam Company, of which E. C. Carll, Augusta, Me., is the president, will erect at Bangor, a plant for the manufacture of art pottery, tiles, etc. It will consist of buildings, 50 x 100 ft., and 50 x 50 ft., two stories. The business of the company will be moved from Metuchen, N. J., in the spring.

The Chandler Company, Springfield, Mass., manufacturer of metal goods, will erect a factory in that city, 42 x 77 ft., two stories.

The Northampton Emery Wheel Company, Leeds, Mass., has brought out a high speed motor-driven buffing lathe, designed for rapid and accurate buffing and polishing work.

A syndicate headed by Edward Heffernan will erect at Lynn, Mass., an eight story factory building, 500 ft. in length, for rental. It will be constructed of brick, steel, concrete and hard pine, and will be located near the West Lynn station of the Boston, Revere Beach & Lynn Railroad. The cost will be about $400,000. Primarily the purpose will be to house the business of shoe manufacturers. Other additions to general manufacturing facilities in New England are the following: Brainerd & Armstrong Company, New London, Conn., weave shed, 50 x 104 ft.; Massasoit Company, Chester, Mass., three story brick mill, 40 x 150 ft.; Magnesia Talc Company, Waterbury, Vt., grinding mill, 200 ft. long, and bagging room, 60 x 84 ft.; Sidney Blumenthal Company, Shelton, Conn., plush manufacturer, two buildings, one 50 x 225 ft., the other 70 x 200 ft., both four stories, to cost $125,000; Hogan Mfg. Company, Hartford, Conn., four story factory, 42 x 79 ft.

Philadelphia

PHILADELPHIA, PA., November 4, 1912.

Sales in the past week, according to reports from machinery merchants, have footed up a good total, although there is still room for considerable improvement. Manufacturers are gradually becoming more actively engaged, but orders are usually small individually. In special machinery a fair volume of business is moving and manufacturers of this class of equipment are feeling more sharply the delay in obtaining deliveries of raw materials. Here and there price advances are reported, this being more noticeable in special than in standard types of equipment. Very little business has been placed by the railroads, and definite inquiry from these buyers continues extremely meager. Second-hand equipment of all classes has been in fair demand, merchants finding comparatively ready sales for machine tools of the modern types. Active conditions continue in the foundry trades.

Arrangements have been completed for the building of a new plant at Chester, Pa., by the Dawson Mfg. Company, Syracuse, N. Y., which will manufacture a special rolling grate. Walter Birtwell, of Chester, Pa., and J. F. Gillison, of Philadelphia, are interested in the new enterprise.

The Crew-Levick Company, Land Title Building, is taking estimates on a one-story boiler house, 34 x 45 ft., to be erected at Commercial and Mifflin streets.

Revised plans are in progress by Ballinger & Perrot for a proposed four-story addition for the Lester Piano Company, at Lester, Pa.

The R. S. Newbold & Son Company, Norristown, Pa., is particularly busy in its plate work and machine shop departments, and moderately busy in the foundry department. The volume of business which has been received by this company is considerably in excess of what it was several months ago.

The Hilles & Jones Company, Wilmington, Del., has received orders for a large amount of punching and shearing machinery from railroads and structural steel fabricators. Shipments have been made to the National Steel Car Company, Hamilton, Ont., as well as other steel car manufacturers and railroads. The Hilles & Jones Company is now making its line of rotary bevel shears in three sizes for ½, ¾ and 1-in. steel plate.

Supplemental to the incorporation of four companies organized for the purpose of constructing dams

in the Delaware River between Trenton and the Delaware Water Gap, four additional power companies have taken charters under the New Jersey laws. These include the Alpha Power Company, the Milford Hydro Electric Company, the Buskill Hydro Electric Company, and the Delaware Hydro Electric Company, the incorporators of which are named as follows: George H. Stein, G. Hamilton Colket, H. B. Gill, J. F. Shroder, J. R. Gerkes and John A. Hansil, all of Philadelphia, also George H. B. Martin and John MacPeak, of Camden, N. J., and W. B. Linn, of Wayne, Pa.

The Improved Lion Gas Machine Company, formerly located at 502 Allegheny avenue, has moved its plant to 3405 Market street, Philadelphia. Considerable additional equipment will be required for installation in the new plant, including a set of rolls 38 in. or larger; a 4-ft. brake, wiring and turning machinery and a beading machine. Second-hand equipment in good order is preferred.

Baltimore

BALTIMORE, MD., November 4, 1912.

Transactions in the machine tool market in October showed some irregularity, and the aggregate volume of new business was somewhat smaller than in the previous month. In quite a number of lines of machine tools inquiry has been well maintained, but while orders have developed rather unsatisfactorily the tool builders are steadily increasing in point of activity, particularly makers of special equipment. An absence of demand for woodworking machinery has been particularly noticeable. Business in boilers and engines has been rather scattered and such as has developed has been confined to equipment of the smaller sizes. The railroads do not appear inclined to place orders for machine tool equipment very freely; in instances, inquiries recently bid against have been temporarily held up. Contractors' equipment has been in lighter demand. The demand for small tool equipment and machine shop supplies is irregular. Business in second-hand boilers and engines and machine tools is reported as being fair. Fabricators of structural steel and ornamental iron work are busy; some shops are operating at full capacity but are somewhat handicapped by delayed deliveries of their raw material. The bulk of the orders coming to local fabricators have been small, few requiring above a few hundred tons. The foundry trade is gradually becoming more active. The trade generally views the situation optimistically and looks forward to increasing activity in practically all lines.

The Consolidated Can Company is taking bids for the erection of a concrete boiler house, 36 x 58 ft., one story.

The Flynn & Emrich Company, Holliday and Saratoga streets, has acquired adjoining property and will erect an addition to its foundry. The building which will be 135 ft. square will be of steel and corrugated iron and the floor space will be used entirely for molding purposes, particularly for bench and small floor work. No additional equipment will be required.

Application for a building permit for a one-story garage, 80 x 112 ft., at 514-516 Colvin street, has been made by Julius Levy. The building is to be of brick and will contain the usual equipment.

Miller & Graham, paint manufacturers, have awarded a contract for a five-story fireproof manufacturing building, to be erected at 21 South Gay street, to H. S. Shealey. It will be used for paint making purposes for which the necessary machinery is to be purchased. Electricity will be used for power purposes, current being purchased from the local power company.

Riggs, Distler & Stringer, engineers, have the contract for the vacuum cleaner installation in the new Garrett Building. Considerable business is being figured on in moderate capacity boiler and engine installations, as well as heating and ventilating work. The firm is in the market for a large number of radiator valves, modulating valves and vacuum cleaner valves in connection with contracts already in hand.

The Bartlett & Hayward Company is now installing its machine tool equipment in its new machine shop, the construction of which has been recently completed. Business is reported as being exceedingly good.

John D. Adt has practically completed alterations to property adjoining his plant, which was recently acquired and a large portion of which will be used as an erecting shop. Several orders for special tobacco working machinery have recently been taken, including one for export to South America. October has been a very satisfactory month and the outlook for business is equally as good.

The Kennedy Foundry Company, Charles and Wells streets, will build a one-story addition, 52 x 87 ft., to its foundry building, which will be used as an addition to its molding floor. A new shipping room, cleaning and tumbling room, as well as a power house, will also be erected. A gas engine and producer plant, necessary generator to produce electricity for use in connection with the plant and additional equipment for the tumbling room, will be installed. The various improvements will increase the capacity of the plant fully 35 per cent.

Plans are being prepared by Theodore Wells Pietsch, architect, for a bottling house to be erected at the brewery of George Brehm & Sons. The building will be 40 x 100 ft., and equiped with the latest type of bottling machinery.

John Blotkamp has made application to the Inspector of Buildings for permission to use the premises 527-529 Colvin street, as a brass foundry and to install a 30-hp. gas engine.

Plans are being prepared for extensive improvements to the plant of the Monticello Distillery on Guilford avenue. Local architects are engaged, it is said, on plans which will involve an expenditure of $85,000.

A charter has been granted the Baltimore Roofing & Asbestos Mfg. Company of Maryland, with a capital stock of $800,000.

Chicago

CHICAGO, ILL., November 4, 1912.

General inquiry for machine tools has been exceptionally good in this market in the past week. Inquiries have been followed quite rapidly by sales, indicating an urgent need by machine shops. The Illinois Central Railroad is about to issue a very large list in addition to the one aggregating about $18,000, mentioned last week, which is itemized below. The Chicago, Milwaukee & St. Paul and the Chicago, Rock Island & Pacific have yet to place the bulk of the business for which bids were recently received. The recent Illinois Central list is as follows:

One 6-ft. plain radial drill, motor driven.
One 36-in. vertical drill, motor driven.
One 32-in. draw cut shaper, motor driven.
One 16-in. x 6-ft. portable lathe, motor driven.
One 50-ton forcing press.
One 36-in. heavy duty engine lathe, motor driven.
One No. 2 plain milling machine, motor driven.
One flue cleaner, motor driven.
Two motor driven grinders.
One car sill gainer, motor driven.
One 1½-in. double head bolt cutter.
Two power hammers.
One double end punch and shear, motor driven.
One 600-ton driving wheel press.
One 90-in. driving wheel lathe, motor driven.

The National Oil Gas Generator Company, Chicago, has been incorporated with a capital stock of $5,000, to manufacture and deal in carburetors, generators, metal goods, etc. The incorporators are Walter D. Hawk, Samuel S. Holmes, and George E. Dierssen.

The Acme Steel Goods Company, 2834 Archer avenue, Chicago, is building an addition, 35 x 135 ft., to its machine shop. The company intends building a large warehouse in the spring.

The Goetz Company has completed plans for a one-story addition, 60 x 150 ft., to its factory, at 1802 Clybourn avenue, Chicago, to cost $10,000.

The Harris Steel & Wire Company, Chicago, has been incorporated with a capital stock of $125,000 by I. S. Blumenthal, Maurice Alschuler and C. C. Brosius.

The Tower Grove Foundry Company, 4451-53 Race Course, Chicago, is erecting a foundry at a cost of $3,900.

The Textile Mfg. Company, Champaign, Ill., recently suffered a loss by fire to its building, machinery and stock of $50,000. Repairs will be made at once.

The Benton Pump & Foundry Company, Benton, Ill., has been organized with a capital stock of $27,500 to do a general machinery manufacturing business. The incorporators are Moses Pulverman, J. E. Myers and Frank St. Clair.

A. E. Montgomery, Moline, Ill., has purchased a site of three acres in that city on which is to be erected an elevator factory, 240 x 240 ft. Architect O. Z. Cervin of Rock Island, Ill., is preparing plans.

John G. Patterson, Milwaukee, Wis., is erecting a factory at Third street and Christian lane, to cost $30,000.

The I. B. Rowell Company, which recently moved its plant to Waukesha, Wis., from Menominee Falls, has been obliged to make an addition to its new plant

not yet completed. The entire structure is of concrete with saw tooth roof.

The Schuessler Foundry Company, Alton, Ill., has started work on its new foundry building in that city.

The Racine-Sattley Company of Racine, Wis., manufacturer of wagons and farm implements, will move its entire plant to Springfield, Ill., where only a branch office has been located in the past.

Detroit

DETROIT, MICH., November 4, 1912.

While business has been fairly good in machinery circles the past week, there has been a slight diminution in activity, which is attributed by some to the near approach of election day. Inquiries continue good and a number of negotiations for a moderate amount of equipment are pending. The automobile trade continues to absorb a considerable quantity of equipment each week, although the buying is quiet and is placed not only in this city but in other parts of the country as well. A very satisfactory volume of business is being transacted in the second hand machinery market. Local foundries continue busy and the demand for steel castings is especially strong. Gray iron plants also report the outlook promising and a large booking of orders. Machine shop supplies are in strong demand. Building circles are more active, considerable new work has come out and contractors are anxious to rush outside work during the continuance of favorable weather. The scarcity of labor and some lines of building material, notably common brick, is serious.

The Superior Candy Company, Detroit, has awarded the contract for the erection of a new factory building. The structure will be 50 x 100 ft., two stories of brick construction.

Krentler Bros., Detroit, manufacturers of lasts, etc., have incorporated their business under the style of the Krentler-Pym Machine Company with a capital stock of $10,000, and will manufacture shoe-making and other machinery. Edwin A. Krentler and Charles F. Pym are at the head of the new company.

The C. M. Hall Lamp Company, Detroit, maker of automobile lamps, has increased its capital stock from $110,000 to $150,000. The company is completing a large addition to its factory.

The Detroit Graphite Company, Detroit, paint manufacturer, has increased its capital stock from $250,000 to $350,000.

The Warren Motor Car Company, Detroit, has filed notice of an increase of capital stock from $300,000 to $600,000.

The Michigan Steel Castings Company, Detroit, has increased its capital stock from $60,000 to $90,000.

The West Michigan Steel Castings Company, Muskegon, Mich., has been organized with a capital stock of $15,000. The new company will engage in the general foundry business.

The W. H. White Company, Boyne City, Mich., will erect a power plant to serve its flouring mill.

Lebster Bros., Flint, Mich., dealers in metals, are preparing to erect a new building to be utilized as an iron and brass foundry.

The Herzog Art Furniture Company, Saginaw, Mich., has increased its capital stock from $200,000 to $500,000 and will shortly commence the erection of a new five-story factory building. A considerable amount of new equiment will be installed.

The Board of Supervisors of Calhoun County, Marshall, Mich., has voted to expend the sum of $15,000 for the purchase of road making machinery.

The American Sign Company, Kalamazoo, Mich., maker of electric signs, has increased its capital stock from $15,000 to $150,000, and will immediately begin the erection of a new factory building to cost, it is stated, $100,000. C. M. Davis is president and general manager.

The Belknap Cement Products Company, Greenville, Mich., has been organized by Thomas R. Belknap and Joseph Eichelburg, with $50,000 capital stock. The new company takes over the Greenville Gravel Company and the Belknap Cement Company, and will immediately enlarge its plant.

The Marquette County Gas & Electric Company, Ishpeming, Mich., is erecting a small factory for the manufacture of paint from the by-products of its gas plant.

The Wernicke-Hatch Pump Company, Grand Rapids, Mich., has filed articles of incorporation giving its capital stock at $180,000. The company will manufacture pumps of a new design. The incorporators include O. H. L. Werincke, W. R. Harvey and William A. Hatcher.

The Buchanan Pattern Works, Buchanan, Mich., has been organized by H. Bristol and others, and will engage in the manufacture of patterns and do a general woodworking business.

The Plank Flexible Shaft & Machine Company, Grand Rapids, Mich., organized for the purpose of manufacturing a patent flexible shaft and other metal working machinery, has been incorporated with $50,000 capital stock. Palmer A. Jones, J. Raymond Plank and John A. Finch are among the incorporators.

Cleveland

CLEVELAND, OHIO, November 4, 1912.

While inquiries are not so plentiful, dealers report a good volume of orders, nearly all of which were for single tools. The largest order reported came from southern Ohio, being for 11 standard tools. Makers of building machines and vertical boring mills are considerably behind on deliveries. In handling equipment there is a heavy demand for small cranes and hoists and locomotive cranes, but little inquiry for large handling plants. The scarcity of common labor and the higher wages that are being paid for such labor is stimulating the demand for labor saving equipment. Scrap dealers, for example, being unable to secure men to work in their yards, are buying locomotive cranes for handling material with magnets. Local machine tool dealers report a good volume of business in prospect from Canadian railroads and car shops. The demand for heavy punches has improved. In electrical lines there is a good demand for equipment for small installations. Second hand machinery is moving freely.

The Champion Machine & Forging Company, Cleveland, has commenced the erection of extensions and improvements to its plant. These will include an addition to its forge department that will double the size of that department and new buildings for the heat treating department. The company expects to purchase shortly four new hammers, die sinkers and probably some other machinery equipment.

The Industrial Car Company, Cleveland, has changed its name to the Electric Locomotive & Car Company. This company has recently added to its line of products and is now building electric cars and locomotives. J. P. Copland has recently become connected with this company as manager.

The W. S. Taylor Company, Cleveland, will shortly purchase considerable polishing and transmission machinery for equipping a new plant addition that is now being erected.

The Harris Mfg. Company, Salem, Ohio, has been incorporated with a capital stock of $10,000 to manufacture sanitary barn equipment. A. E. Harris, Frank S. Harris and others are the incorporators.

The Hotz Foundry & Machinery Company, Fremont, Ohio, maker of brass and aluminum castings for automobiles and other products, is looking for a site in that city on which to erect a new plant, the company's present quarters being too small.

The Akron Welding Company, Akron, Ohio, has been incorporated with a capital stock of $10,000 to manufacture automobile parts, machinery, etc. Milton W. Smith, George I. Stuber, Edward H. Boylan, David H. Morgan and Lucile H. Smith are the incorporators.

The Champion Stove Company, Cleveland, is erecting a four-story brick addition 85 x 80 ft. to its plant. It will be used for assembling purposes. The company will probably need some new equipment in the line of drills, emery wheels, etc.

The Toledo Plow Company, West Toledo, Ohio, has increased its capital stock from $25,000 to $50,000. The company is planning an enlargement of its plant to accommodate its growing business.

The French Oil Mill Machinery Company, Piqua, Ohio, has commenced the erection of a new plant addition, 76 x 114 ft., two stories.

The Krein Chain Company, Wapakonesta, Ohio, has commenced the erection of an addition to its plant, 40 x 50 ft.

The plant of the Ohio Foundry Company, Salem, Ohio, was damaged to the extent of about $5,000 by fire October 31.

The plant of the National Brass & Copper Company, Lisbon, Ohio, was partly destroyed by fire October 29. The loss is estimated at $25,000.

Cincinnati

CINCINNATI, OHIO, November 4, 1912.

Machine tool builders report the month of October as being a fairly satisfactory one, although orders were confined mostly to small lots of tools, and while the export trade served to swell the total average, domestic business was also reasonably good. A number of the large railroad lists sent out some time ago are yet unclosed, and it is expected that buying on these will be done before the close of the year.

Electrical equipment continues in excellent demand, but is confined principallv to the smaller sizes of generators and motors. In spite of the increasing popularity of internal combustion engines in this territory, boiler makers are busy, and have excellent prospects for a good business the coming year.

All of the foundries are very active, but there is the same scarcity of skilled labor reported that the machine tool manufacturers are also experiencing.

The Von Wyck Machine Tool Company, Cincinnati, has been sold to a new company, of which C. B. Kern, formerly of the Kern Machine Tool Company, and Philip Fosdick, are the principal stockholders. While the sale has not yet been formally confirmed by the courts, it is understood that the new management will remodel the existing plant and increase its output of lathes as soon as possible.

It is reported that the Knecht Planer Company, Cincinnati, will soon remove its plant to Piqua, Ohio, and that a large manufacturing building will be fitted up for the company's use.

The Brodt Shoe Company, Portsmouth, Ohio, has purchased the Portsmouth Shoe Company's factory, and has plans under way for enlarging the building. Some power and transmission equipment will be required.

The Cincinnati Ice Delivery Companv has had plans prepared for an additional ice and cold storage plant to be erected in Lockland suburb, for which considerable special equipment will be required.

The Rauh & Rauh Shirt Company, Cincinnati, will soon move into an eight-story factory building, and will require a large number of small electric motors.

The Standard Register Company, Dayton, Ohio, is contemplating moving into larger quarters and increasing its output. Nothing is yet known as to its machinery requirements.

The Gem City Machine Company, Dayton, Ohio, has been incorporated with $25,000 capital stock, to mnaufacture special machinery. Joseph E. McAdams is named as one of the principal incorporators.

The Holters Shoe Company, Cincinnati, has leased new quarters on Sycamore street, and will require additional machinery and power equipment.

The Dayton Paper Bottle Company, Dayton, Ohio, is a new incorporation with $75,000 capital stock, to manufacture paper bottles and other novelties. Charles Crist and H. C. Long are named among the incorporators.

A new six-story power building, for small manufacturers, will be erected soon in Cincinnati by the Graydon Estate, at Sixth and North streets. Elzner & Anderson are the architects in charge of the plans.

The Columbus Auto Parts Company, Columbus, Ohio, has been incorporated with $25,000 capital stock. In addition to a general manufacturing business the company expects to conduct a repair department for which some machine tools will be required. Charles J. Krag and John J. Stoddart are among the incorporators named.

Contract for the new addition to the Columbus Iron & Steel Company's plant at Columbus, Ohio, recently mentioned, has been awarded to F. H. Grube. The new building will be of concrete and brick construction, most of which will be occupied by the company's machine shop.

The Biltmore Box Company, Biltmore, N. C., will remove to Nicolette, W. Va., and will need some additional woodworking machinery.

The Queen & Crescent Railroad Company will soon commence work on the improvements, recently mentioned as contemplated, to its shops and roundhouse at Ludlow, Ky. All of the equipment has not yet been purchased.

The Bode Wagonworks Company, Cincinnati, is having plans prepared for an extensive addition to its plant on Providence street.

The National Cash Register Company, Dayton, Ohio, is asking for bids on a mechanical heating system to be installed in one of its buildings recently completed.

The Monitor Furnace Company, Cincinnati, recently placed an order with the Obermeyer Company for a number of electric cranes, to be installed in its plant on Gest street.

Indianapolis

INDIANAPOLIS, IND., November 4, 1912.

William P. Lyons, vice-president of the Lyons-Atlas Engine Works, successors to the Atlas Engine Works, this city, says the large plant will be running at full capacity within a few weeks, as soon as machinery can be installed and sufficient men obtained. There are now 400 employed and this will be increased as rapidly as possible to 1200. The manufacture of steam engines will be discontinued, except the making of repairs for them. It has a large number of engines in service in the country, and it will not be a small part of the work of the plant to keep up repairs for them. Chief energies will be put, however, on the manufacture of automobile and internal combustion engines.

The Hetherington & Berner Company, Indianapolis, is completing installations of a municipal asphalt plants for the cities of Chicago, Ill., Detroit, Mich., and for Camden, N. J.

The Ham-Meix Mfg. Company, Indianapolis, has been incorporated with $150,000 capital stock, to manufacture self-starters for motors and other patented articles. The directors are Harry W. Hamilton, Benjamin F. Meixell and Samuel B. Sutphin.

The Sargent-Alsop Company, Indianapolis, has been incorporated with $15,000 capital stock, to manufacture novelties. The directors are H. J. Alsop, H. G. Sargent and H. M. Crawford.

The Standard Bridge & Culvert Company, Terre Haute, Ind., has been incorporated with $5,000 capital stock, to manufacture bridges and culverts. The directors are C. V. Joseph, Harry B. Smith and Albert Strouse.

The Board of Trustees of Normal City, Ind., has decided to build a muncipal waterworks system.

The Business Association of Evansville, Ind., has closed a contract with a manufacturer of gas engines in Michigan to remove his plant to Evansville. The site for the factory has been chosen. The payroll of the company, it is said, will be $350,000 a year.

The Muncie Gas Engine & Supply Company, Muncie, Ind., has increased its capital stock from $100,000 to $250,000.

Negotiations are pending for the removal of the Globe Tool & Die Works from Chicago to Portland, Ind. L. A. Martin is owner of the works.

Birch & Birch, 1001 East College street, Crawfordsville, Ind., are contemplating new additions to their plant. New machinery will be installed.

The United States Scale Company, Terra Haute, Ind., suffered a loss October 25 to its plant by fire estimated at $6,000. Repairs will be made at once.

The Central South

LOUISVILLE, KY., November 4, 1912.

Business in all lines of machinery continues good, despite rising prices, which are doubtless to be attributed to this very fact, in connection with the crowded condition of the mills, preventing them from getting material out as rapidly as could be desired. Several factories report that they are running behind on their orders for this reason. There are no particularly large deals being made, but a steady volume of small orders is reported, showing good general conditions. The demand for motor-driven machine tools is particularly good, especially for the foreign trade, which is taking hold of this class of goods with considerable eagerness, once having been educated to their utility and economy.

The recently organized Southern Motors Company, which had planned the erection and equipment of a large building as a garage and machine shop for automobile repairs, rendered such action unnecessary by the purchase of the business of the Miles Auto Company, with its garage and large machine shop.

E. D. Morton & Co. have completed the installation for the Louisville Water Company of a 17-in. x 12-ft. Greaves-Klusman belt-driven lathe and accessories, at the pumping station, and like equipment at the company's Crescent Hill station; a 24-in. upright drill press, and a 12-in. sensitive drill press, both with direct motor connection, at the Third Street store-room, as well as a 14-in. direct connected grinder and accessories. E. D. Morton & Co. have recently been appointed local

selling agents for the Mac-it screw, manufactured by the Mac-it Parts Company.

The James Clark, Jr., Electric Company has completed arrangements with the Lampton, Crane-Ramey Company, paint manufacturer and dealer, in addition to handling kindred lines, for the installation of complete alternating current equipment in its plant, to take the place of its present direct-current equipment.

The city of Louisville has purchased through the Brandeis Machinery & Supply Company a Chicago street-paving concrete machine, made by the T. L. Smith Company of Milwaukee, and a portable gasoline-driven Universal rock crusher, manufactured by the Universal Crusher Company.

In connection with extensive improvements being made in its plant, necessitated by expansion into the heavy motor-truck field, the Kentucky Wagon Mfg. Company has installed a 24-in. lathe, a bolt-cutter, multiple spindle drill, and a sensitive radial dril, all furnished by the E. A. Kinsey Company of Cincinnati.

The James Clark, Jr., Electric Company, Louisville, has let contracts to the Alfred Struck Company for the construction of two corrugated iron warehouses, with concrete foundations, each about 50 x 100 ft., to be constructed at the company's plant for additional storage room.. They will cost about $2,500.

The Fayette National Bank, Lexington, Ky., is to receive bids shortly on the erection of its 15-story office building at Main and Upper streets. Plans and specifications are now ready.

Marion, Ky., is to hold an election November 5 on the question of authorizing the City Council to issue bonds to the amount of $45,000, of which $25,000 is to be used for building waterworks.

The voters of Corydon, Ky., will decide November 5 whether to approve a $10,000 bond issue to pay for the erection of an electric light plant. Prospects for the carrying of the proposition are said to be bright.

A spoke and rim factory is to be erected at Campbellsville, Ky., by J. Allen Russell, who plans a building 25 x 50 ft., with a daily capacity of 12,000 spokes.

It is reported that the Paris Gas & Electric Company, Paris, Ky., operating the gas and electric plants, has been disposed of to a Chicago syndicate, which plans to enlarge and improve the property.

The Croft Oil & Gas Company, Lexington, Ky., has been organized with a capital stock of $25,000, to develop a leasehold of 7000 acres of coal, gas and mineral lands which it has acquired in Morgan County, Ky., in the vicinity of Cannel City. The incorporators are Younger Alexander, Lexington; J. W. Johnson, Lexington; S. M. Croft of Huntington, W. Va.

A proposed bond issue of $25,000 is to be voted on at Versailles, Ky., on November 5, the proceeds to be used for the improvement of the waterworks system.

The Clay Light & Ice Company, Clay, Ky., has been organized with a capital stock of $6,000 by G. E. Horron, J. H. Russell and C. R. Clark, all of Clay. The company proposes to erect a plant. This concern was referred to in last week's *Iron Age* as the Public Service Company of Clay.

The Acme Cotton Ginning Company has been incorporated at Hickman, Ky., with a capital stock of $6,000. The incorporators are Lyman N. Hine, P. Rand and John P. Campbell, all of Hickman.

An electric light plant is to be installed at once at Campbellsburg, Ind., for which only the engine and generator have as yet been purchased. Bids for other materials required will be received at 5 Beekman street, rooms 414-416, New York City.

The Jackson Lumber Company, Jackson, Tenn., will probably rebuild its veneer plant, which was recently destroyed by fire.

Stewart & Bruckner, 157 Third avenue, North, Nashville, Tenn., have purchased a building in that city which they will remodel and equip as a boiler and machine shop and sheet-iron works.

The Jackson Ornamental Iron & Bronze Works of Jackson, Tenn., Thomas B. Hardman, manager, desires prices on a traveling crane.

The Chucky River Hydro-Electric Company, Limestone, Tenn., has been incorporated by J. F. Arnold of that place, and Noah T. Heisey, Victor M. Weaver, James L. Stewart and Samuel K. Varnes, all of Harrisburg, Pa., with $25,000 capital stock, and will construct a water-power plant on the Nolachucky River.

The saw-mill of Graves & Gilliland, at Main street and the Cumberland River, Nashville, Tenn., was destroyed by fire last week. The mill is to be rebuilt as rapidly as possible, the plan being to install all machinery and accessories for a seven-foot modern band mill.

The Homer Laughlin China Company, East Liverpool, Ohio, propose to add to its present plant at Newell, W. Va., a 15-kiln pottery, with a 300 x 600 ft. brick building of one and two stories, to cost about $250,000 with machinery, and employing 400 men. At the same point the Edwin M. Knowles China Company of East Liverpool, Ohio, and Chester, W. Va., are erecting a pottery consisting of 15 ware kilns and 12 decorating kilns. The main building is 285 x 700 ft., costing $200,000, and is to be modern in every respect, equipment for sanitation, ventilation, heating and lighting being required. The plant will also have a dry sprinkler system, and electricity will be used throughout, for which purpose a two-phase alternating generator, direct connected, will be installed.

The Marathon Motor Company, Nashville, Tenn., which has a present capacity of 30 cars a week, is increasing its plant to double this capacity.

The Louisville office of the General Electric Company has sold to the Louisville Cement Company a low-pressure 750 k.w. turbine.

The Louisville & Nashville Railroad Company has purchased for use in its South Louisville shops from the Westinghouse Electric & Mfg. Company, through the Louisville branch, a 500 k.w. direct-current high-speed Westinghouse geared turbine.

Birmingham

BIRMINGHAM, ALA., November 4, 1912.

It has been the quietest period in the machinery market of the entire fall, owing to the elections. However, general conditions are strong and the let-up in activity will be short-lived. Pumps are in demand at coal mines and sawmills, and other factories are buying considerable quantities of small goods.

Two syrup factories will be established at Dawes, Ala. Dr. G. E. Newson of Mobile, Ala, is interested.

Application has been made at Pensacola, Fla., for the incorporation of the Jennings & Varnadore Company, with a capital stock of $40,000, to operate turpentine plants, etc. T. A. Jennings, Pensacola; C. A. Varnadore, Scotts Ferry, Fla., and associates are the incorporators.

W. M. Edwards & Son, Franklin, N. C., will establish two plants near Gainesville, Ga., to cut blocks out of dogwood and persimmon. Blocks will be shipped to France for manufacture into shuttles.

The J. I. Blount Machinery Company, Birmingham, Ala., has been chartered with a capital stock of $30,000. J. I. Blount is president.

The Bellevue Highlands Company, Gadsden, Ala., will erect a standpipe with 100,000 gal. capacity on Lookout Mountain.

The Alabama Roof & Tile Company has been chartered with capital stock of $25,000. Robert Treschel is president and James E. Dunlap secretary and treasurer.

J. G. Granberry & Co., Waycross, Ga., have begun operations of new plant manufacturing interior finish, screens, sash, etc.

The Ozona Citrus Growers Association is improving its packing plant at Ozona, Fla., by installing machinery, etc.

The Alabama Portland Cement Company, Demopolis, Ala., will enlarge its plant at Spocari, Ala.

J. E. Sirrine, architect of Greeneville, S. C., is preparing plans for extension of plant of Trion Mfg. Company of Trion, Ga.

It is reported that the Philips Mfg. Company will establish foundry for manufacture of patented woodworking machinery at Orlando, Fla.

H. B. Stallings and E. B. Wooten will open a garage, auto repair shop and blacksmith shop at Deland, Fla.

The Cherokee County Gin Company, Leesburg, Ala., has been incorporated with $2,000 capital stock to operate gins. J. M. Hannah is one of the incorporators.

The Americus Power Company, Americus, Ga., Frank Lanier, president, is considering proposition to establish $35,000 gas plant.

Samuel Nisbet contemplates establishing an ice factory at Jacksonville, Ala.

The Stinson Milling Company, Center, Ala., has been incorporated with a capital stock of $10,000, to operate a lighting plant. W. A. Stinson is interested.

Largo, Fla., has voted $10,000 of bonds for establishing electric lighting plant.

The Inverness Power Company, Inverness, Fla., will apply for a charter to install electric lighting system.

The Southern Art Metal Company, Americus, Ga., has purchased equipment for a new plant. It will manufacture metal roofing, tiles, etc. L. W. Rose is general manager.

The Sheffield Coal & Iron Company, Russellville, Ala., will install two new coal washers and develop an iron ore property.

James L. Morlan of Mobile is reported as contemplating the establishment of a factory for making wool shipping cases.

Hemminger & Clemmons, Plant City, Fla., will establish a planing mill.

Texas

AUSTIN, TEXAS, November 2, 1912.

Besides the large amount of harbor and other improvements soon to be started in Mexico by the Federal Government there promises to be great activity in the establishment of public utility plants in the different cities of that country as soon as the present political disturbances are over. Just now there seems to be an improvement in the revolutionary situation and hopes are entertained that the government may be strong enough to bring about soon a complete restoration of tranquillity. In Texas the machinery demand is increasing and dealers believe that sales will keep up remarkably well during the winter. Owing to the mildness of the climate, the winter months are the best for outside construction work, such as that of irrigation and drainage systems. In New Mexico and Arizona plans are on foot for installing new machinery and ore reduction mills at a number of mines.

The project of extending the sea wall and grade raising westward so as to safeguard double the present area of Galveston is under consideration there. It is estimated that the proposed improvements will cost about $5,000,000. George E. Mann, county judge, can give information.

The construction of a sewer system at Bishop will soon be started. R. B. Hall is mayor.

Bids for the construction of a sewer system at San Benito will be opened November 18. Bonds in the sum of $30,000 have been issued for the proposed improvement.

The Texas Cotton Mill Company is doubling the capacity of its cotton mill at McKinney, at a cost of $100,000.

A. R. Sprague and associates are promoting the establishment at San Benito of a creamery which will cost about $25,000, it is stated.

The Valley Box & Crate Company which was recently organized at San Benito will install a plant for the manufacture of boxes and crates.

The H. J. Heinze Company, Cincinnati, Ohio, contemplates installing a large canning factory at Rusk, Texas. The Young Men's Progressive League is assisting in the proposed enterprise.

The Bay Shore Oil Company, Houston, has been organized with a capital stock of $20,000. It will operate in the oil fields of that section. The incorporators are E. A. Sterling, J. C. Montgomery and T. H. Bass, all of Houston.

The City Council of San Angelo, has under consideration the matter of installing a water filtration plant at that place in connection with the municipal waterworks system.

L. L. Shield will build an oil mill and cotton gin at Santa Anna. He expects to have the plants finished and ready for operation by the opening of the next cotton season.

The Victoria Safe & Lock Company will build an addition to its safe and lock manufacturing plant at Victoria.

The Artesia Light & Power Company is constructing electric power transmission lines from its plant at Artesia, N. M., to a tract of land five miles from town which is to be irrigated by means of water pumped from shallow wells. About five pumping plants will be installed upon the land and each will be operated by electric power.

The Sunset Mining Company will install an ore concentrating plant at its King mine near Hachita, N. M. L. M. Stiles, of San Antonio, is president and manager.

The Detroit Copper Company, Morenci, Ariz., has purchased all of the holdings of the New England and Clifton Copper Company situated in that section. The transfer embraces 125 mining claims, an extensive system of trams and other valuable property. It is planned by the Detroit Copper Company to install ore reduction mills and make other important improvements.

The Minneapolis Copper Company will soon resume the work of erecting a smelter at a point 20 miles west of Cumpas, Sonora, Mexico.

The Dolores Mining and Development Company, Oakland. Cal., will soon install a stamp mill and make other improvements to its mining property near Magdalena, Sonora, Mexico.

Major George W. Littlefield of Austin will colonize a tract of 70,000 acres of land situated in Lamb County, Texas. His plans contemplate the boring of a number of wells and the installation of an irrigation pumping plant upon each well. He will also establish a modern town upon the property.

The Compania Fundidora de Fierro y Acero de Monterey of Monterey, Mexico, will install a complete equipment of oil burners under its battery of boilers embracing 5000 hp as its iron and steel plant there.

St. Louis

ST. LOUIS, MO., November 4, 1912.

The machine tool market has been rather quiet the past week, owing to the inevitable tendency to hesitate with the election so close at hand. There is no loss of confidence, apparently, in the business situation, but rather a disposition to halt until the election is over. Business conditions in this territory are thoroughly sound and fully disposed to ignore politics as a real factor. Generally, the trade looks confidently for renewed activity immediately after the ballots are cast.

The assembling plant of the Ford Motor Company, St. Louis, will vote December 9 upon an increase of the companys capital from $400,000 to $600,000 for the purpose of increasing the mechanical equipment of the plant now nearing completion. It will be operated with Keokuk hydro-electric power and will have a capacity of 330,000 barrels per year.

The Western Light & Power Company, represented by F. R. Mott and Paul D. Cable of St. Louis, has been granted a franchise to equip a plant and to serve power and light current to consumers in St. Louis County, Missouri. The plant will be so located as to supply also parts of Jefferson and Frankin counties.

The Business Men's League of St. Louis announces that it is in negotiation, for the establishment in St. Louis, by Pittsburgh men, of a blast furnace of 600 tons daily capacity; by a Cleveland syndicate of a large rolling mill; by a Philadelphia concern of an underwear factory and by other business men of comfort and bedding manufactories, all to require considerable mechanical equipment.

The assembling plant of the Ford Motor Company, St. Louis, is being pushed forward with a view to the equipment of a five-story building, 150 x 200 ft., with machinery, etc., for the assembling of knocked down motors shipped from the main plant for distribution to St. Louis territory.

The Ray E. Pickerel Walnut Lumber Company is to establish a plant in St. Louis at Clara and Natural Bridge Road for the manufacture of gun stocks for the United States Government. The negotiations were closed by the Business Men's League of St. Louis.

The Cliffdale Mill Company, Brickeye Station, Mo., with $16,000 capital stock, has been incorporated by R. E. Rombauer, Theo. A. Carron and Louis Doerge of St. Louis, and will equip a milling plant at once.

The Canton Implement Company, Canton, Ill., has been incorporated with $50,000 capital stock by U. G. Orendorff, R. L. Mason and L. H. Gillet to equip an implement manufacturing plant.

The Kansas City Milk & Produce Company, Kansas City, Mo., has been incorporated with a capital of $50,000 by D. A. Murphy, S. F. Harris and J. Philip Kanoky with the purpose of establishing and equipping a large creamery plant.

The Wilbur Bed Spring Company, Miami, Okla., has been incorporated with $40,000 capital stock by Thomas K. Bowman and C. S. Cook of Springfield, Mo., and Bert E. Wilbur of Miami, Okla., to equip and operate a plant for the manufacture of bed springs, etc.

The Gleenol Mfg. Company, New Orleans, La., with $250,000 capital stock, has been incorporated by L. E. Valloft and C. E. Ramsey of New Orleans, George Rea of Bay St. Louis, Miss., and B. F. Hardman of Montgomery, Ala., and will equip a large manufacturing plant at once.

The Val Verde Planting & Mfg. Company, Livonia, La., has been incorporated with $150.000 capital stock by E. A. Allen, S. P. Schwing and Charles A. Smith, and has purchased an $80,000 sugar plantation on Bayou La Fourche and will construct and equip a large sugar mill and install other mechanical equipment.

The Allino Switch Box Company, St. Louis, has been incorporated with $60,000 capital stock by J. F. Brinkmeyer, C. C. Maison and W. F. Peters to equip a plant for the manufacture of electrical devices and machinery.

The plant of the American Panel & Lumber Company, Newport, Ark., acquired by O. E. Jacobs and others of Kalamazoo, Mich., will be remodeled and put in operation. Equipment for pulp manufacture is to be added shortly.

A hub factory to cost with equipment about $15,000 will be established at Texarkana, Ark., by the Hub Mfg. Company, Jonesboro, Ark., of which F. J. Bosler is head. It will work up timber on a 15,000 acre tract owned by Bosler.

The plant of the Wagoner Ice & Cold Storage Company of Wagoner, Okla., was destroyed by fire the past week. It will be replaced and re-equipped at once, it is reported.

The Interstate Interurban Railway Company is reported to be ready to begin construction of power houses and its line between Ponca, Okla., and Arkansas City, Kan. The president is O. L. Brown of the latter city.

The Sewerage and Water Board of New Orleans, La., will receive bids until December 20 next for furnishing and erecting mechanical draft apparatus under the direction of George G. Earl, superintendent.

The Bromide Oolitic Stone Company, Bromide, Okla., is prepared to increase the capacity of its plant by the addition of a gyratory crusher of 30 tons' daily capacity.

The Electrical Development Company, New Orleans, La., with $10,000 preliminary capital stock, has been organized and incorporated by Lyman C. Reed, D. H. Holmes and C. B. Murphy with plans for the construction of electrical power plants at different points in the South.

The Sulphur Oil and Development Company, Sulphur, Okla., with $10,000 capital stock, has been incorporated by T. B. and L. H. Laumann of Oklahoma City, Okla., and A. B. Hugos of Enid, Okla., to develop property owned by them.

The Meridian Mill Company, Meridian, Miss., with $10,000 capital stock, has been incorporated by C. E. Myers, Thomas Gray and Clyde Brooks, with plans for the equipment of a milling plant at once.

The Spavinaw Mineral Development Company, with $66,000 capital stock, has been incorporated at Perry, Okla., by George J. Chaplin, George A. Master, Jos. W. Appleman and others to equip and operate mining property owned by them.

A plant for the manufacture of plow pullers is planned to be constructed at Joplin, Mo., by Samuel Jones of Fredonia, Kans.

The Tower Grove Foundry Company, St. Louis, has plans for the construction and equipment of a foundry at 4451 Race Course avenue, St. Louis.

The Nelson-Jacks Lumber Company, Shreveport, La., with $25,000 capital, has been incorporated by J. H. and F. W. Jacks of Wichita, Kans., and F. E. Nelson to equip a sawmill and develop timber property controlled by them.

The Knapp Lumber Company, Nowata, Okla., with $15,000 capital stock, has been incorporated by John R. and A. R. Knapp and Thomas E. Elliott, and will equip a lumber manufacturing plant.

The Adams Mfg. Company, St. Louis, with $20,000 capital stock, has been incorporated by L. Freund, L. Cronbach, A. P. Lyons, Milton Cohen, L. P. Aloe and L. Blumenstock to equip a plant for the manufacture of the Adams Junior binder, a loose-leaf device.

The Pacific Coast

PORTLAND, ORE., October 29, 1912.

The machine tool business remains in fairly good shape. New inquiries, for the most part, are of no great importance individually, but single tool orders are coming out well from many sources. In the general machinery market, buying in some lines is curtailed by the approach of winter, though a good many orders have come out for installation before or during the winter. Plans are under way for considerable mining and other equipment to be ready for shipment to Alaska in the spring. It is too early for much Alaska cannery business, but many orders are expected after the first of the year, and some contracts have already been placed for boat construction and repairs. Some new shipbuilding contracts are being let, and several lumber steamers have recently been launched at northern ports, though most of the machinery will be installed at San Francisco. A few large sawmill orders are expected during the winter.

The Rigid Lock Bed Company, with a capital stock of $75,000, expects to install a factory in this city about the first of the year.

The Gambrinus Brewing Company has prepared plans for a large refrigerating plant at its local brewery.

The Beaver State Motor Company has been incorporated in this city with a capital stock of $300,000, with the intention of manufacturing automobiles. The incorporators are P. Combs, J. L. Bailey and G. A. Johnson.

It is announced that the White Pass & Yukon Railway will shortly let a contract for the construction of two steamers at a cost of $60,000 each.

The Houston Dredging Company, Seattle, Wash., has been organized and intends to install a gold dredge on Kenai peninsula, Alaska, next spring.

The Hood River, Ore., Gas & Electric Company is planning improvements to its plant which will more than double its present capacity.

The Brookings Lumber & Box Company, formerly of Highland, Cal., is preparing to develop a large timber tract in Curry County, Ore. The improvements will include a sawmill in adition to logging railroad, engines, etc.

The Klamath Falls Iron Works, Klamath Falls, Ore., is completing plans for a new foundry building and warehouse, and expects to have the largest foundry in Southern Oregon.

D. C. Jacklin of Salt Lake City has let a contract to the Seattle Construction & Drydock Company for the construction of a 212-ft. steel twin-screw yacht, to cost about $250,000.

Four submarine boats being built for the Electric Boat Company in the yard of the Seattle Construction & Drydock Company will be launched in December. Two are for the United States Navy and two for the Chilean Government. The Electric Boat Company has closed a contract with the Key City Light & Power Company for a considerable amount of current to be delivered at Port Townsend, Wash.

E. H. Dodge, of the Dodge Lumber Company, is having plans drawn for a lumber carrying steamer of a new type, called a drydock steamer, to have a capacity of 5,000,000 ft. of lumber.

E. H. Stanton & Co. are planning to build at Spokane, Wash., one of the largest cold storage plants of the north coast district.

Municipal officials at Seattle, Wash., are considering the advisability of calling a bond election next March, to vote on a $425,000 bond issue for the construction of a steam auxiliary electric light plant.

The city of Seattle has just received bids for a lot of gravel washing and conveying machinery for the construction of the Cedar Falls dam.

The Bryant Lumber & Shingle Company, Seattle, Wash., expects to start work shortly on the reconstruction of its sawmill, which was burned recently.

The Willamette Iron & Steel Works, this city, has a contract for 2000 tons of riveted steel pipe, 9 ft. diameter, for the Pacific Power & Light Company's development in southern California.

The Railway Equipment Company, Seattle, Wash., has leased the entire building at First and Oak streets, that city.

Canada

TORONTO, ONT., November 2, 1912.

There is a large output of manufactured articles and of the machinery required in nearly all industries and constructive operations, but, large as the output is, the demand keeps a long waiting list of orders. The state of trade could hardly be more satisfactory. The weather has of late been rather favorable, the autumn continuing open and rain being less frequent. This has been taken the utmost advantage of, but the roads are not good. They have scarcely time to become fit for traffic in some busy parts of the country.

It is understood that as a result of the visit of the cabinet ministers to Quebec city to look over the situation, the Government has decided to build the proposed drydock itself as an ordinary public work.

A company has been formed to manufacture gaso-electric cars in Guelph, Ont. The following are the newly-elected officers: President, L. H. Piercy, Detroit, Mich.; vice-president, John McHardy, Guelph; secretary-treasurer, H. F. Slater, Toronto.

The Berlin, Felt Boot Company, Berlin, Ont., has decided to erect a three-story addition to the present large factory on Victoria street. It is the intention of the company to commence building operations as soon as the plans have been approved.

A syndicate is applying for a Federal charter under the title of Manufacturers' Terminal, Ltd., of Montreal, with an authorized capital stock of $7,000,000, half pre-

ferred and half common, and has purchased a tract of property lying between Notre Dame street east and the river front, in Longue Point ward, comprising about 16 acres, and with a deep-water frontage of about 1200 ft. The intention is to establish a manufacturing terminal. The first development will consist of four large buildings, each 150 x 400 to 500 ft. and six stories, with track spurs running into each building unit, and through the Harbor Commisioners' Railway, connecting with every trunk line railway in the Dominion.

New companies incorporated by letters patent last week include Smart-Woods, Ltd., Montreal, with $5,000,000 capital stock. C. A. Smart, of Montreal, and Col. J. W. Woods, of Ottawa, are among the incorporators. It will manufacture bags, lumbermen's supplies, etc.

In Toronto a block of land, including the Wilkinson Plow Company's plant, has been sold to the Bateman Mfg. Company, Grenloch, N. J., for $125,000. The property is about 8¼ acres in extent, and fronts on Davenport road, Symington avenue and Wiltshire avenue. It is bounded on the south by the Canadian Pacific Railway tracks, and on the east by the northern division of the Grand Trunk. The purchasing company will manufacture agricultural implements there.

The Cornwall & York Cotton Mills Company, St. John, N. B., is planning extensive additions to its equipment.

Popular voting on the by-laws at Peterborough, Ont., to authorize the outlay of $20,000 to purchase a site for De Laval Dairy Supply Company resulted in the adoption of the by-law by a vote of 1318 for, 54 against. The work on the new buildings, 112 x 400 ft., is already under way.

If satisfactory terms can be reached with the city regarding a fixed assessment, the Page-Hersey Company will increase the capacity of its pipe mills at Guelph, Ont., by the erection of a big new building to cost in the neighborhood of $50,000. The mills are working night and day at the present time, and are still unable to keep up with the orders received, and as the company does not care to increase the Welland plant, it will add to the Guelph mills to the extent mentioned.

Miekle & Dyment are about to erect a sawmill at Fenelon Falls, Ont. A box factory, a machine shop and some other buildings will be put up at the same time.

The ratepayers of Watrous have approved an agreement between the municipal council and C. A. Irving, representing parties who propose to establish bottling works there, the plant to cost not less than $30,000.

The Saskatchewan Bridge & Iron Company, Moose Jaw, Sask., will spend $10,000 on additional buildings and $50,000 on new machinery.

The Canadian Western Lumber Company's dry kilns at Fraser Mills, B. C., which were burnt down recently, are to be rebuilt.

Col. A. D. Davidson announces that arrangements for the establishment of car building works at Port Mann, B. C., are completed. Five hundred men will be employed in the new works.

Tenders for the erection of locomotive repair shops, blacksmith shop and a roundhouse for the Canadian Northern Railway at Port Mann., B. C., will be called for on the return of T. G. Holt, executive agent of the railway.

The Spokane Ornamental Iron & Wire Works Company, Spokane, may establish a plant in Edmonton, Alberta. The secretary-treasurer of the company was in Edmonton in that connection a short time ago.

At a meeting of the Regina, Sask., board of trade, it was decided at once to proceed with the organization of a $500,000 company to erect a concrete elevator with storage capacity of 1,000,000 bushels.

The Ogilvie Flour Mills Company, Montreal, is building another large mill, the point selected being Medicine Hat, Alberta.

Government Purchases

WASHINGTON, D. C., November 4, 1912.

The Department of the Interior, Office of Indian Affairs, Washington, will open bids November 20 for furnishing material and labor for the installation of an electric lighting system at the Pipestone Indian School, Minn.

The Isthmian Canal Commission, Washington, will open bids under canal circular 743, January 13, for furnishing floating cranes of the revolving type having a capacity of 250 tons.

The Treasury Department, office of the supervising architect, Washington, will open bids November 26 for furnishing and erecting an electric passenger elevator in the United States post office, Roswell, N. M., and on November 23 for the installation complete of an electric passenger elevator in the post office at Washington, N. C.

The Isthmian Canal Commission, Washington, opened bids October 25 under canal circular 737 for 18 guard valve machines, nine right hand and nine left hand as follows:

Coffin Valve Company, Boston, Mass., $43,200; Earl Gear & Machine Company, Philadelphia, Pa., $26,400; Exeter Machine Works, Pittston, Pa., $34,038; Otis Elevator Company, New York, $38,475; Richard Mfg. Company, Bloomsburg, Pa., $33,282; Rosedale Foundry & Machine Company, Pittsburgh, Pa., $30,978; Steach-Schmidt Mfg. Company, York, Pa., $32,400; Wheeling Mold & Foundry Company, Wheeling, W. Va., $32,670 and $34,470, alternate; Westinghouse Machine Company, East Pittsburgh, Pa., $32,805.

Trade Publications

Core Binders.—J. W. Paxson Company, Philadelphia, Pa. Circular. Calls attention to the efficiency of Pax-oil and Ros-core binders for foundry coreroom practice. The former is used exclusively in the production of machine made cores and is claimed to possess all the advantages of rosin and the economies of core oils with the additional feature that the absorption of moisture is prevented Laboratory tests have proved that only one-third as much visible gas is made as when rosin is burned. Ros-core is used exclusively for hand made cores and also for general foundry work where cores are made from gravel or from sands which contain bonding material. Like the other binder this will not absorb moisture.

Coal Handling and Conveying Machinery.—J. M. Dodge Company, Nicetown, Philadelphia, Pa. Catalogue. Concerned with the Dodge system for storing anthracite coal, cranes, telpher systems, adjustable chutes and car tippers. All of these are illustrated and briefly described and there are a number of views of installations with a short text description of the special features of each.

Upright Drilling Machines.—W. F. & John Barnes Company, Rockford, Ill. Catalogue No. 71. Covers a line of upright drilling machines and other machine tools which includes a horizontal radial drilling machine, planing machines of several types and an adjustable screw press. An illustrated description of one of the heavy gang drilling machines listed appeared in *The Iron Age*, July 8, 1909.

Pneumatic Rammers and Foundry Equipment.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 121. Illustrates a line of pneumatic rammers and foundry equipment which includes sand sifters, chipping hammers, pneumatic grinding machines and casting cleaners, geared hoists and air compressors. All of these are briefly described and there are condensed tables of specifications.

Lathe Dogs.—J. H. Williams & Co., Brooklyn, N. Y. Folder. Shows the various types of Vulcan safety dogs which can be furnished. A special feature of these dogs is the use of a safety screw which does not project beyond the body of the dog and the building up of the space around the screw hole.

Case Hardening.—Ideal Case Hardening Company, United States Rubber Building, New York City. Pamphlet. This is the fourth edition of a book of useful information and practical rules on the case hardening and annealing of steel. After a brief introduction, the process of case hardening is described in considerable detail and a number of applications are given. Brief mention is also made of the pack hardening and annealing processes together with the use of the Ideal case hardening compound.

Portable Drilling Outfits.—Sullivan Machinery Company, 122 South Michigan avenue, Chicago, Ill. Bulletin No. 58-O. Describes a line of portable drilling outfits designed for removing rock in highway construction, trenches for sewer pipes and water mains, block holing in stone quarries and other work in which the rock to be excavated is scattered and too small in quantity to warrant a fixed compressor and drilling plant. These outfits consist of a gas engine driven air compressor mounted on a two-horse truck and two or more Sullivan hand feed hammer drills. There are a number of engravings showing the outfits in use, together with views of the various parts.

Air Compressors.—Gardner Governor Company, Quincy, Ill. Brochure entitled "Compressed Air and Its Commercial Uses." Concerned with the various applications of compressed air in industrial establishments. After a brief statement of the advantages of compressed air, the various uses are taken up and described in some detail, the text being supplemented in each case by halftone engravings. Views of the various types of compressors built by this company are also included.

Boring, Drilling and Milling Machine.—Lucas Machine Tool Company, Cleveland, Ohio. Circular A-7. Refers to the new No. 31 Precision boring, drilling and milling machine which has been recently brought out. This machine combines the features of two of the company's earlier machines, one of which, the No. 33 size, was illustrated in *The Iron Age*, April 4, 1912. The special feature of this machine is the ability to vary the feed to any part at will and to secure a quick return easily.